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# American Foundryman

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New York Chosen for 1941 Convention, See Page 2 — Job Evaluation, Merit Rating and Time and Motion Study, See Inside Front Cover — The Running of Castings, See Pages 3 to 8.

December  
1940

## Job Evaluation, Merit Rating and Time and Motion Study



THE JOB Evaluation and Time Study Committee of the American Foundrymen's Association has been endeavoring to bring to our members information which will show practical applications to the foundry industry. During this time of increased industrial activity, management finds itself face to face with new problems and tasks. Therefore, it must find a means of attacking and settling them to the satisfaction of all concerned.

One of the management's most useful aids to this end today is a well organized and administered Industrial Engineering Department. The functions of such a department are unlimited. However, the following are the most important: (1) Job evaluation, (2) merit rating, and (3) time and motion study.

By "job evaluation," we mean a plan devised to evaluate the different occupations within an industry, taking into consideration the occupation itself, the wage scale of a district and, above all, the relationship of one job or craft as compared to another. For instance, if the hourly rate of a screw machine operator is one dollar, what is the occupation of a floor molder worth in comparison? This cannot be done by guess work, it must be done with an occupational rating plan which can easily be understood.

In conjunction with job evaluation, we need "merit rating". Why is John Jones worth \$1.00 per hour and why is Jim Doe only worth 60 cents per hour? The only way to determine this is by merit rating. There may be great differences of opinion on this. We may compare the situation with buying an automobile. Why do you buy one automobile and why do I buy another? In my opinion, the car I choose is the best. In your opinion, the one you choose is the best. The only way we can determine which is really the better car is by impersonal comparison of qualities such as price, upkeep, performance appearance and trade-in value. These, and nothing else, will determine the superior of the two.

Men are not equal and neither are their earning capacities equal. Merit rating is an impersonal comparison of human qualities taking the following into consideration: (1) Quality of work, (2) quantity of output, (3) adaptability to new and changing surroundings and conditions, (4) knowledge about the job being performed, (5) dependability—can you depend on the worker to be on the job and do it right?, (6) attitude—is he antagonistic or co-operative or indifferent?

"Time and motion study" is very essential in that it provides management with the means of ascertaining the output for a measured day payment plan, the price per piece for piece work, or the hourly task for a task and bonus payment plan. It is accurate observation and analysis of each job to be done, and of the equipment being used to do it. Such observation should bring about elimination of wasted time and energy and result in obtaining the most efficient and economical processes and practices that are possible for the company to provide. The ultimate goal in bringing these inefficiencies to the surface and correcting them is increased profits for the company, increased employee earnings, improved working conditions, employees trained in the best and most efficient methods, and lowered costs.

*Frank E. Wartgow*

F. E. Wartgow, Chairman,  
Job Evaluation and  
Time Study Committee.

F. E. Wartgow, time and motion study engineer, American Steel Foundries, East Chicago, Ind., is chairman of the A.F.A. Committee on Job Evaluation and Time Study. This committee sponsors annual convention sessions to present the foundry applications of job evaluation and time study as gathered from related industries. Working with Mr. Wartgow are James Bird, assistant supt., The Liberty Foundry, Inc., Wauwatosa, Wis.; Eugene Bouton, supt. of time and motion study, J. I. Case Co., Racine, Wis.; E. J. Metzger, supt., Falcon Bronze Co., Youngstown, O.; H. C. Robson, works manager, Joy Mfg. Co., Franklin, Pa.; Jeff. Alan Westover, supt. of time and motion study, Clark Equipment Co., Buchanan, Mich.

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# American Foundryman



## C O N T E N T S

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# New York Chosen for 1941 Convention

**N**EW YORK, the Empire City, has been chosen by the board of Directors of the American Foundrymen's Association as the 1941 Convention City. In accepting the invitation of the Metropolitan Chapter to hold the next convention there, the Pennsylvania Hotel known throughout the country for its excellent facilities, was chosen as the place and May 12, 13, 14 and 15 as the dates. This will be the first convention of A.F.A. to be held in New York since 1905.

Following the extremely successful convention in Chicago, A.F.A. received invitations to hold its convention from many cities throughout the country. Following consideration of the facilities offered by these cities by a board committee on convention location, and a discussion of the various factors entering into the selection of a site for the convention, the committee announced its selection as New York and recommended to the Executive Committee that the 1941 Convention be held there. The Executive Committee then ordered the matter to be submitted to the Board of Directors for letter ballot, the results of which showed unanimous approval of the committee selection.

New York has many advantages. In the first place, the 1941 convention will be the first held in the eastern section of the country since 1934. As the 1941 convention will be held without an exhibit, proper meeting facilities were given first

consideration in the selection of the place. Hotel Pennsylvania has excellent facilities for the type of meeting to be held next year and for that reason was chosen, following an inspection of many New York hotels. There is no question about adequate hotel accommodations as New York's reputation in this respect is world-wide.

## Technical Program

Since the 1941 Convention will be devoted exclusively to technical discussions, especial care is being taken to provide an interesting and worthwhile program. According to present plans, which are tentative, malleable and non-ferrous sessions will be held on Monday and Tuesday, May 12 and 13, with gray iron and steel sessions on the following two days. Interspersed throughout the program are sessions on subjects of a general nature, such as refractories, job evaluation and time study, costs, apprentice training, foreman training, safety and hygiene, plant and plant equipment. This convention will also feature the first sessions on patternmaking supervised by the new Patternmaking Division of A.F.A. Another feature of the technical sessions will be the lecture course on "Coremaking," which has been arranged by the A.F.A. Convention Lecture Course Committee. H. W. Dietert, Harry W. Dietert Co., Detroit, will deliver the series of lectures on this important subject. Material for the lectures is being contributed by acknowledged leaders in this field throughout the industry.

As at the 1940 Chicago Convention, plans call for the delivery of the Annual Board of Awards Lecture at the annual business meeting. At that time, the annual awards for outstanding service to the foundry industry will be made under the direction of the Board of Awards of the Association. Program for the annual dinner now is under consideration and plans call for making it as successful an occasion as the one held at the 1940 convention.

## Plant Visitation and Ladies' Entertainment

One difficulty which arose in the selection of a convention city was the fact that in many places a plant visitation program was impossible under present conditions. Such a program is being contemplated as a feature of the New York Convention and many plants within a reasonable distance of Metropolitan New York have indicated their willingness to participate.

As usual, a ladies' entertainment program will be staged and it is both impossible and unnecessary to enumerate the features available for this section of the program. They are well known to all. Because of these advantages, a large number of ladies are expected to attend the 1941 convention.



An inspiring sight for all Americans to see—The Statue of Liberty.

# The Running of Castings<sup>†</sup>

By Felix Henon

**A**NY preliminary study of mold pouring includes a combination of the following factors: (1) filling the mold with sound metal; (2) avoiding the deterioration of the mold by the liquid metal; (3) directly evacuating the gases; and (4) feeding the massive parts of the casting during solidification.

Measures to be taken to control these four factors include: (1) the filling method; that is, the manner by which the liquid metal is transferred from the ladle to the mold; (2) the type of runner, which controls the disposition of the gates carrying the liquid metal into the main mold cavity; (3) the rate of

the liquid slag and the solid elements which can leave the ladle. The cleanliness can be ensured by filtering or by applying the fact that the impurities in the metal are nearly always lighter than the metal itself. In the latter case, runner basins are so arranged that the impurities remain there or turbulence is created for their retention.

The sketches referred to are not scale size, but are only schematic. The sections of the gates are distinctly exaggerated.

## Methods of Mold Filling

*Tipping ladle pouring directly into the runner*—This method of filling is the simplest and is

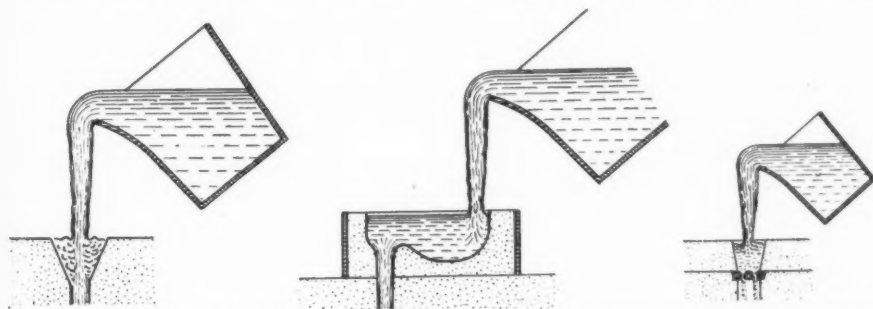


Fig. 1—(Left) Tilting ladle pouring directly into the runner. (Center) Tilting ladle pouring into a runner basin. (Right) Tilting ladle pouring through a filter core.

casting; (4) the position and dimensions of the risers and feeding hands; (5) the position of the mold during casting; (6) the temperature of the mold; and (7) the casting temperature. Pouring is an important phase in making a casting and often has a preponderating influence on its successful production.

It is proposed to study several pouring methods and the types of gating most usually employed. Some simple examples of application will be given. Particular attention will be given to the following points: clean metal; metal movements in the mold, notably the speed of its arrival in the mold cavity, and the casting speed.

## Clean Metal

Clean metal for casting is obtained solely by keeping back

shown in Fig. 1—Left. The use of a skimmer prevents, to a certain extent, the passing of ladle slag into the mold. However, the impurities in suspension do pass. It is essential to maintain the runner top full, so as to give an opportunity for the impurities to rise to the surface and not enter the mold. This precaution gives the additional advantage of preventing the entry of air.

*Tipping ladle pouring into a runner basin*—This method of casting is shown in its simplest form in Fig. 1—Center. The basin being kept full during casting, the slag and the impurities, lighter than the metal, remain on the surface. Entering into the same category is pouring through a filter core, Figs. 1—Right and 2. The filter core is a very effective means of keeping back metal impurities; it requires very fluid metal. The

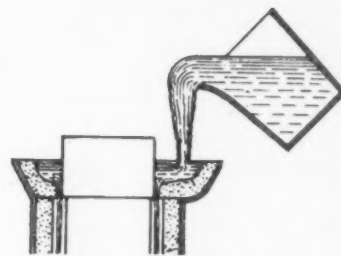


Fig. 2—Another type of filter core used when pouring.

use of a runner basin or a filter core is not recommended for alloys showing a tendency to separate out by order of density.

*Bottom-pouring ladles*—This method of pouring is shown in Fig. 3—Left. The cleaning of the metal is effected by the floating of the slag; from this fact, it is necessary to avoid complete emptying of the contents into the mold.

## Types of Runners

There are two main types of runners to be considered.

*Direct running*—In this case the metal falls directly and freely into the mold cavity. A simple example is shown in Fig. 3—Right.

*Interrupted stream*—The metal flow is broken before entering the mold cavity. Here several cases are illustrated, varying according to the positioning of the ingates. Fig. 4 illustrates the use of ingates in the upper part of the mold cavity, midway and at the lowest part, usually called bottom running.

It is now proposed to examine in some detail the factors which govern the different types of running used with each of the three filling methods. In all the calculations, it is supposed that

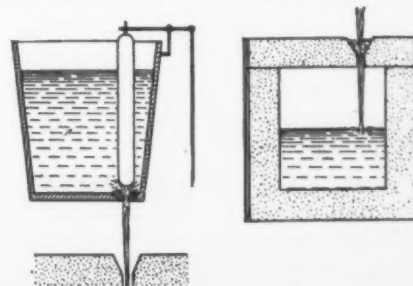


Fig. 3—(Left) An example of filling using bottom-pouring ladle. (Right) Direct running into mold cavity.

<sup>†</sup>Abstracted from "La Fonte" and published in Foundry Trade Journal, October 10, 1940.

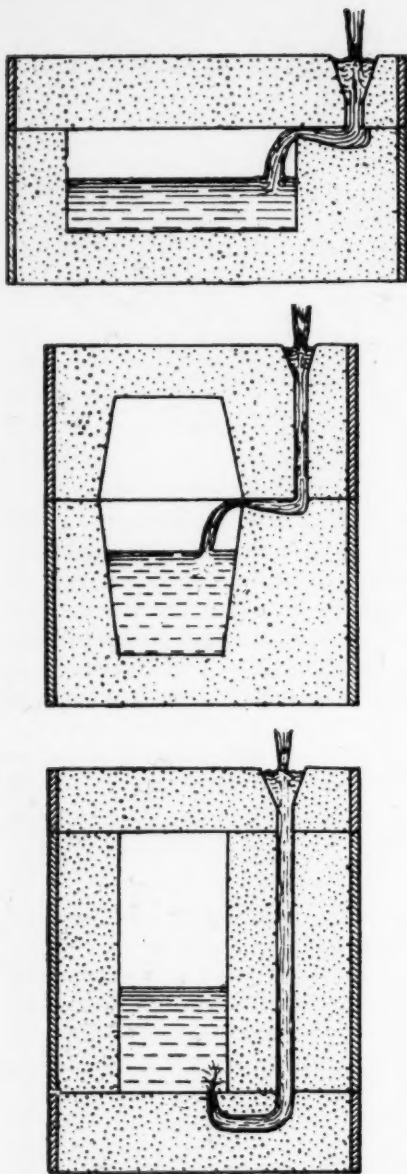


Fig. 4—Positioning of ingates to break the flow of metal before entering the mold cavity. (Top) Used at the top of the mold. (Center) Used in the middle of the mold. (Bottom) Used in the bottom of the mold.

the metal to be cast is a perfect liquid, and such losses as friction, change of section and direction in the various gates will be neglected. The results given are purely theoretical. Nevertheless, they give useful information as to the relative effects of the various filling methods and the different types of gating. They present a clearer conception of the rules of application.

It is evident that experiments carried out in certain well-defined cases, allowing the inclusion of correction factors to apply to theoretical results, will be of value.

#### Direct Running

##### Direct from tipping ladle.

The cylindrical runner MABN in Fig. 5—Top Left is directly connected to the casting; it is surmounted by a conical opening. It receives what can be presumed to be a stream of metal circular in section, at AB, the section being equal to that of the downgate. The calculations are based on this rule, which should be maintained during the whole teeming period. The metal falls from the ladle as a free stream; its movement is uniformly accelerated, its speed increases, the input yielded by the stream being constant at all heights; its section decreases.

Supposing  $S_e$  to be the section of the orifice AB; and  $V_e$  the speed of the stream across this section, and  $Q$  the input:

$$\text{Then } V_e = \sqrt{2gH}$$

$$\text{Because } \sqrt{2g} = 4.43$$

Therefore,  $V_e = 4.43\sqrt{H}$  meters per second.

The input is therefore:

$$Q = V_e \times S_e = 4.43\sqrt{H} \times S_e$$

Below AB the diameter of the stream continues to diminish. For the same height of drop  $H$ , the section of the opening controls the input of the downgate. This is called the preponderating section of the running system.

**Speed of metal entry into mold cavity**—The speed of the stream in the section MN holds but little interest in this case. The speed of a stream in any given section  $m n$ , situated at a distance  $h$  below the orifice AB, is:

$$v = 4.43\sqrt{H+h}$$

In deep molds, this speed can become sufficiently powerful to injure the bottom, when impacted by the initial stream.

The input delivered by the stream will be:

$$Q = 4.43\sqrt{H} \times S_e$$

In order that the rate of filling remains constant during casting, it is necessary to keep the lip of the ladle always at the same height.

**Note**—In practice, for reasons previously stated, the stream of metal is regulated so as to keep the top of the runners full; filling is, therefore, always carried out according to Fig. 5—Top

Right. It is admitted that the stream of metal is subject to eddies in the funnel, which slow up the speed of dropping without nullifying it. Breaking action by small liquid streams results in a loss of force. Supposing that in AB the loss of force is equal to  $z$ , then the speed  $V_e$  in AB becomes:

$$V_e = 4.43\sqrt{H-z}, \text{ and the input}$$

$$Q = 4.43\sqrt{H-z} \times S_e$$

Below AB, the stream continues its course by a uniformly accelerated movement; its selection becomes increasingly narrowed. For the section  $m n$ , at a distance  $h$  from AB, one has:

$$v = 4.43\sqrt{H-z+h}$$

It is evidently impossible to establish the value of  $z$  other than by experiment. However, without being able to generalize the results obtained in each case, it can be stated that the value of  $H - z$  cannot be less than the distance  $m$  from the top of the runner, the latter always playing the role of a reservoir at a constant level.

Consequent upon the loss of force, due to the conical opening, the speed at AB and the quantity  $Q$  also can vary between two extremes. For example,

$$4.43\sqrt{H} > V_e > 4.43\sqrt{m}$$

or the multiplying by  $S_e$ :

$$4.43\sqrt{H} \times S_e > Q > 4.43\sqrt{m} \times S_e$$

In certain cases, the funnel depth of the runner can be important.

##### Filling by tipping ladle into a runner basin.

This method is sketched in Fig. 5—Left Bottom. There are several different types of runner basins for ensuring that clean metal enters the mold. The simplest form will be considered here, as the results obtained can be applied to other arrangements. The basin is fed by a tipping ladle in such a way that it is constantly full. The basin thus becomes a reservoir with a constant level. It is postulated that eddying is without any action on the flow of the metal. The diameter of the stream leaving the ladle and the drop are no longer important; only quantity matters. The metal flows by the cylindrical downgate MABN.

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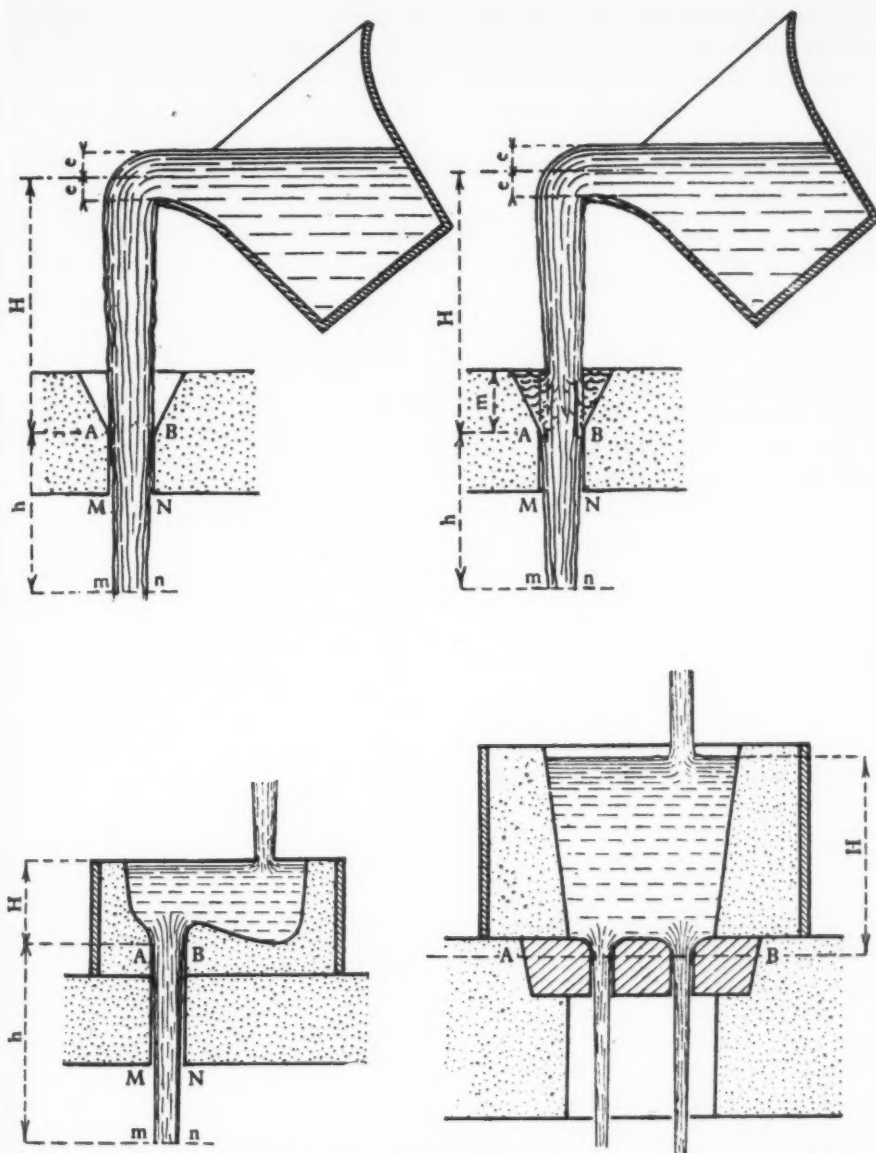


Fig. 5—(Top left) Pouring from tipping ladle into cylindrical runner directly connected to casting. (Top right) Tipping ladle keeping top of runner full of metal. (Bottom left) Filling by tipping ladle into a runner basin. (Bottom right) Filters used in gate with funnel of gate as a reservoir of constant level.

The section AB is taken at the neck of the hole joining the downgate to the basin. This round hole is of some importance. If the downgate is allowed to terminate at a right angle in the basin, it will produce a contraction in the liquid stream which can attain 4/10 of its section. Sometimes it is unnecessary to seek elsewhere for the cause of a casting which is short-run, when these conditions exist. The stream of the metal fills the whole of the orifice AB and then becomes less than the diameter. Once again, it is the section of this orifice that is the preponderating section of the gating system. Continuing to use  $Se$  to designate the section of the orifice AB,  $Ve$  the speed of the stream at the stream's

edge and  $Q$  the input, then:

$$Ve = 4.43\sqrt{H} \text{ and}$$

$$Q = Se \times Ve = 4.43\sqrt{H} \times Se$$

Speed of metal entry into mold cavity—As in the preceding case, this is of little interest. The speed of flow in the section  $m n$  is:

$$v = 4.43\sqrt{H+h}$$

Input of the gating system—

In the same section of entry  $Se$ , the quantity is proportional to the square root of the distance  $H$  from the level of the basin above the section of entry. Where two basins are used having the same gate section, with different distances  $H_1$  and  $H_2$ , the following result is given:

$$\frac{Q_1}{Q_2} = \frac{4.43 \times Se \times \sqrt{H_1}}{4.43 \times Se \times \sqrt{H_2}} = \frac{\sqrt{H_1}}{\sqrt{H_2}}$$

If, for example,  $H_1 = 2H_2$ , then

$$\frac{Q_1}{Q_2} = \frac{\sqrt{2}}{1} = 1.414.$$

By doubling the distance  $H$ , the input is increased by about 40 per cent. In practice, the influence of this distance on input is often but little appreciated.

Filter cores—As has previously been pointed out, the above results are applicable to gates carrying filters, the funnel of the gate being considered as a reservoir of constant level. An example is shown in Fig. 5—Bottom Right. The filter openings are shown with rounded holes on the upper surface. In this case, the distance  $H$  is taken from the base of the rounded portion. The entry section,  $Se$ , is the sum of the sections of the holes in the filter and gives:

$$Ve = 4.43\sqrt{H} \text{ and}$$

$$Q = 4.43\sqrt{H} \times Se.$$

If, as often happens, the holes in the filter have their upper edges in the form of a right angle, the distance  $H$  varies little. On the other hand, due to contraction, the section of the liquid streams diminishes. If  $m$  is the co-efficient of contraction, the true section of the whole of the streams in the plane AB is:

$$Se \times m$$

The preceding formulae give:

$$Ve = 4.43\sqrt{H} \text{ and}$$

$$Q = 4.43\sqrt{H} \times Se \times m$$

It seems germane to state that the coefficient  $m$  can vary between 0.6 and 1.0. Consequently, the filter-core system will not be specially discussed, as it can be considered as a special kind of runner basin for which the same formulae can be applied.

Filling with a bottom-pouring ladle.

Fig. 6 shows the direct filling of a mold from a bottom-pouring ladle. With this system of pouring, it is no longer so easy to control the section of the stream. It is assumed that as the section of the nozzle PQ is less than the section of the opening AB, the latter is never filled. Moreover, it is assumed that the goose-neck arrangement permits the section of the liquid flowing from the ladle to be reduced, but that it has no action on the speed of the liquid streams.

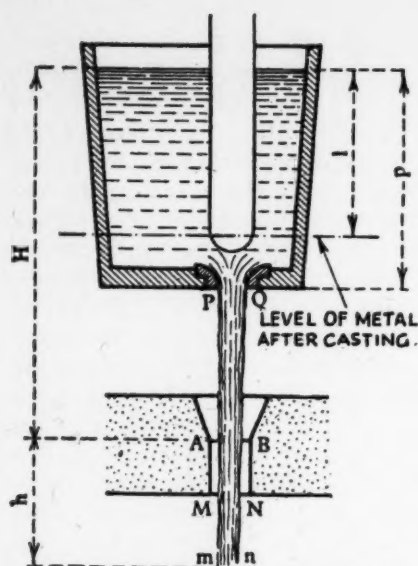


Fig. 6—Direct filling of a mold from a bottom-pouring ladle.

In any given section the speed of the stream is that which would have a material point falling direct from the upper level of the metal in the ladle down to the plane of the section under consideration. As the liquid metal sinks in the ladle progressively with the pouring, the speed decreases in all sections of the stream. If  $Sp$  be the section of nozzle  $PQ$ ;  $Vp$  and  $s$ , respectively the speed and the true section of the stream across the opening;  $p$  the height of the metal above  $PQ$  on starting pour and  $l$  the sinking of the level during the casting, the speed of the stream at  $PQ$  ranges between two limits according to the inequalities:

$$4.43\sqrt{p} > Vp > 4.43\sqrt{p-l}$$

Theoretically two methods of casting can be envisaged.

(1) *Casting with section of stream constant and output variable*—If  $Q_1$  is the output at the beginning of casting and  $Q_2$  that at the end of pouring then

$$Q_1 = 4.43\sqrt{p} \times Sp \text{ and}$$

$$Q_2 = 4.43\sqrt{p-l} \times Sp$$

from which

$$Q_2 = Q_1 \times \frac{\sqrt{p-l}}{\sqrt{p}}$$

For example, if  $p=1$  metre;  $l=0.8$  metre, then

$$Q_2 = Q_1 \times 0.45.$$

The output in this case decreases by more than 50 per cent at the end of the cast.

(2) *Casting with section of stream variable and output constant*—During casting, the sec-

tion of the stream can be increased to compensate for the reduction in rate of flow. If  $s_1$  and  $s_2$  be the sections of the stream at the beginning and end of the cast, and the output be constant, then:

$$4.43\sqrt{p} \times s_1 = 4.43\sqrt{p-l} \times s_2$$

Hence,

$$s_1 = s_2 \times \frac{\sqrt{p-l}}{\sqrt{p}}$$

if it be assumed that the nozzle  $PQ$  remains full, one can replace  $s_2$  by  $Sp$  in the preceding formula, giving

$$s_1 = Sp \times \frac{\sqrt{p-l}}{\sqrt{p}} \text{ and}$$

$$Q = 4.43\sqrt{p-l} \times Sp$$

Maintaining the same system of letters as previously for the various factors, it can be shown that:

$$s_1 = Sp \times 0.45$$

Now for a slight lifting of the lever, the section of the stream increases rapidly, and it is difficult to carry out casting with a constant output. Because of this it is proposed only to discuss casting with a constant stream section and a variable output.

*Preponderating section of the casting system*—With the bottom-pouring ladle, the orifice of entry  $AB$  has no longer the same importance as previously, for in reality the nozzle section  $PQ$  becomes the preponderating section of the casting system.

*Speed of metal entry into mold cavity*—At the section  $AB$ ,

it is:

$$4.43\sqrt{H} > Ve > 4.43\sqrt{H-l}.$$

At the section  $mn$ , it is

$$4.43\sqrt{H+h} > v > 4.43\sqrt{H-l+h}$$

*Input of the gate*—This is governed by the nozzle  $PQ$ . It has been shown to be a variable, and satisfies the expression of the inequalities

$$4.43\sqrt{p} \times Sp > Q > 4.43\sqrt{p-l} \times Sp$$

#### Interrupted Streams

Considering the case where a casting is run half way up the mold cavity, then the results obtained will apply directly to top-casting. It is proposed to deal with gating at the upper level of the mold cavity and to study simultaneously the use of the three filling methods sketched in Fig. 7. From the beginning of the casting, with I and II filling methods (I by tipping ladle pouring directly into the downgate and II a similar ladle feeding a basin), the stream exactly fills the orifice  $AB$ , which gives in this orifice:

$$Ve = 4.43\sqrt{H} \text{ and}$$

$$Q = 4.43\sqrt{H} \times Se$$

With the third method of pouring III (by means of a bottom-pouring ladle), the stream fills the nozzle  $PQ$  and gives:

$$Vp = 4.43\sqrt{p} \text{ and}$$

$$Q = 4.43\sqrt{p} \times Sp$$

The metal in falling meets the bottom of the downgate, collects there and starts to flow into the mold cavity of the casting by the ingate  $MN$ . Assuming that the

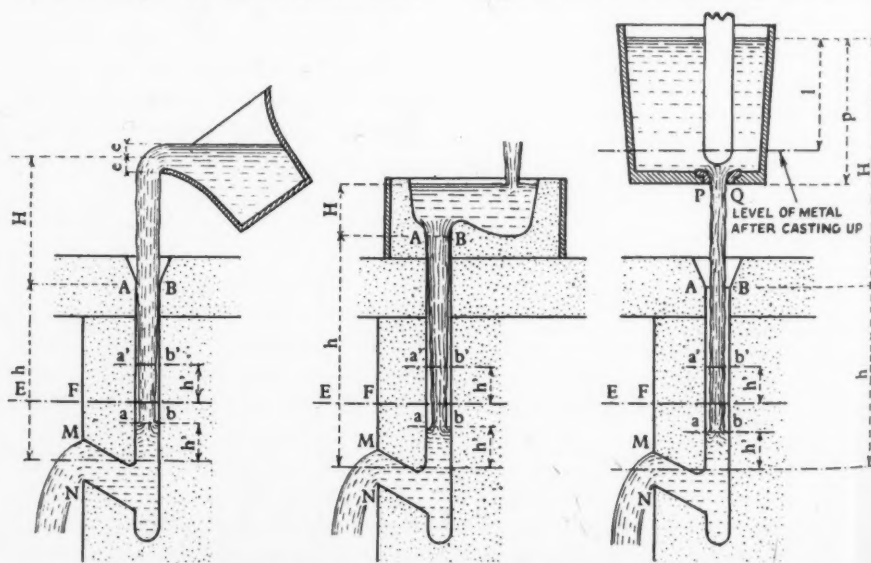


Fig. 7—Three filling methods with gating at the upper level of mold cavity. (Left) Tipping ladle pouring directly into the downgate. (Center) Ladle feeding runner basin. (Right) Pouring by means of a bottom-pouring ladle.

speed of the stream is completely interrupted on arrival at the bottom of the downgate, then taking the moment when the level of the metal in the downgate is at  $ab$ ,  $Sa$  the section of the ingate  $MN$ ,  $Va$  the speed of flow in this section and  $Qa$  the input, this gives:

$$Va = 4.43\sqrt{h'} \text{ and}$$

$$Qa = 4.43\sqrt{h'} \times Sa$$

At this moment, two widely different cases can be envisaged.

*The ingate section  $Sa$  is notably greater than the entry section  $Se$ .* The input  $Qa$  is equal to the input  $Q$  for a low value of  $h'$ ; this represents casting under subnormal pressure.

*The ingate section  $Sa$  is notably smaller than the section entry  $Se$ .* The input  $Qa$  becomes less than the input  $Q$ ; the downgate becomes full. The flow from the section  $MN$  is made under a force equal to the distance from its center of gravity to the top edge of the downgate. This represents casting under pressure.

#### Subnormal Pressure Castings

*Ingate halfway up the mold cavity*—This is assumed to be the case for Fig. 7. Normal conditions of casting being established, then  $Qa = Q$  and one can postulate that:

$$Va = 4.43\sqrt{h'} \text{ and}$$

$$Q = 4.43\sqrt{h'} \times Sa.$$

*Speed of metal entry into mold cavity*—The speed  $Va$  depends solely upon the height  $h'$ , the latter itself depending on  $Sa$  for any given input. Thus, in subnormal pressure casting, a rate of entry of the metal into the mold cavity as low as is desired can be obtained, if the shape of the casting allows of a sufficient increase in the section of the ingate. With a bottom-pouring ladle, the input being variable, the distance  $h'$  and the speed  $Va$  also vary.

The above conditions persist until the moment at which the level of the metal in the mold cavity reaches the opening  $MN$ . From this time onwards the level of the metal in the downgate also rises. Assuming the metal at  $EF$  in the mold cavity, then it will reach  $a' b'$  in the downgate at a height above that

of  $EF$ , which will always be equal to  $h'$  for the flow in the section  $MN$  is governed by the formula:

$$Q = 4.43\sqrt{h'} \times Sa$$

Thus the speed  $Va$  remains constant during the pouring, except when a bottom-pouring ladle is used, when it decreases.

*Input from the downgate*—

This is governed by the stream in the preponderating section of the casting system. When filling with a tipping ladle, it is:

$$Q = 4.43\sqrt{H} \times Se$$

$Q$  is constant if  $H$  is constant. With a bottom-pouring ladle, the conditions are:

$$4.43\sqrt{p} \times Sp > Q > 4.43\sqrt{p-l} \times Sp$$

*Momentary interruption*—The pressures in a mold at the end of casting are generally foreseen as acting upon the top edge of the downgate top or the runner basin. In the direct filling by a tipping ladle it has been assumed that the stream of metal con-

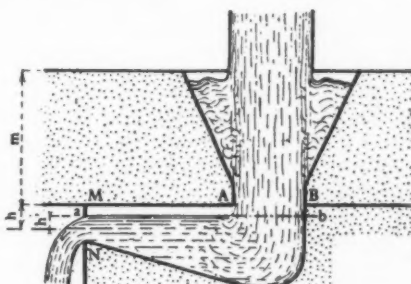


Fig. 8—Top running of the mold cavity.

stantly fills the point of entry  $AB$ . Now when the level of the metal in the downgate reaches this point, the force under which it affects the flow in the opening  $MN$  changes rapidly from  $h'$  to  $H+h'$ , if the input of the stream coming from the ladle has not been reduced in the meantime.

If, at this moment, the metal in the mold cavity has already reached the top of the mold, it can produce a notable super-pressure. That is why it is sometimes noted that with certain molds, apparently well weighted, a sudden lifting occurs at the end of casting, after which everything seems to be normal. The super-pressure can only be of very short duration, for its action stops when the stream is interrupted and the downgate overflows.

*Loss of force due to the fun-*

*nel of the downgate*—The funnel of a downgate can be kept constantly full during direct teeming with a tipping ladle. In this case, it is necessary to take into account the loss of force  $z$ , previously dealt with. In the formulae cited it is necessary to replace  $H$  by  $H-z$ .

*Bottom running*—What has been said in respect to gating halfway up still applies, except for the fact that the opening  $MN$  is closed by metal from the beginning of casting.

*Running at the top part of the mold cavity*—Actually, this type of running is seldom met with in practice. Often the molder fancies he has achieved it when he has done nothing of the kind, for it is necessary to give an exaggerated section to the ingate. Referring to the sketch, Fig. 8, and regarding it in its most favorable light by assuming the loss of force due to the cone to be at a maximum, then

$$H-z=m.$$

Allowing that the level  $ab$  in the "downgate" leaves empty a third of the height of the opening  $MN$ , assumed to be rectangular, then taking  $m$  to be 16 cm., the distance  $MN$  to be 2 cm.,  $h'$  to 2/3 cm. and  $Se$  to be 4 sq. cm., by equating the inputs of the ingate and of the orifice of entry, and by neglecting  $h$  in relating to  $m$ , it clearly gives:

$$4.43\sqrt{m} \times Se = 4.43\sqrt{h'} \times 2/3 Sa$$

$$\text{or } Sa = Se \times \frac{\sqrt{m}}{\sqrt{h'}} \times \frac{3}{2} = 4 \times \frac{\sqrt{16}}{\sqrt{2/3}} \times \frac{3}{2} =$$

30 sq. cm.

The height of the ingate being 2 cm., it would be necessary for it to be 15 cm. long, which in practice is rather a tall order. Actually, the downgate and the conical opening are constantly full; they form a reservoir of constant level in which the section  $AB$  creates a loss of force because of the narrowing which it exerts upon the liquid column.

#### Casting Under Pressure

*Ingate halfway up the mold cavity*—At the beginning of casting, conditions are as shown in Fig. 7; the metal accumulates at the bottom of the downgate and starts to run into the mold cavity. It has been shown that

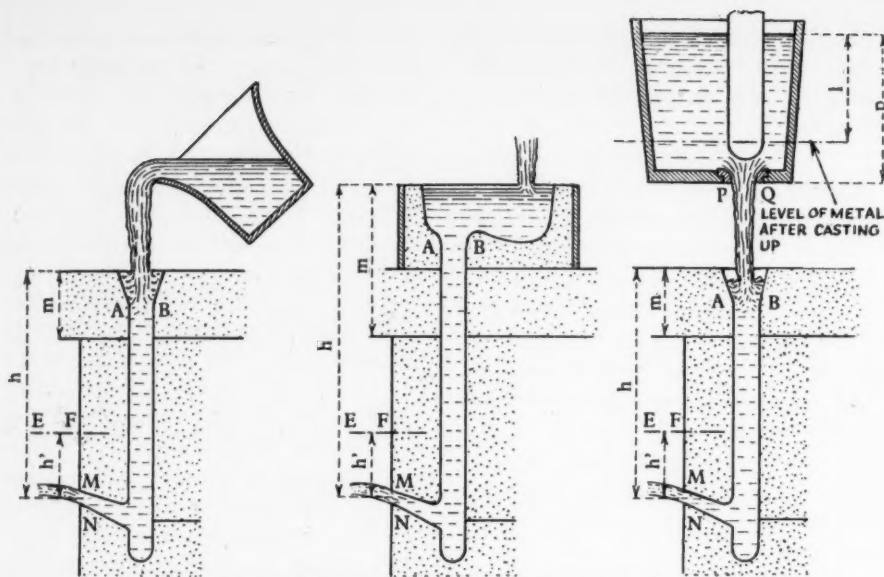


Fig. 9—Downgate acting as reservoir in the three types of pouring.

the input  $Qa$  from the ingate is notably less than the input  $Q$  from the stream of the ladle. As the runner becomes full, it is necessary to lessen the input from the ladle in order to attain  $Qa$ . This state of affairs is shown diagrammatically in Fig. 9.

From now on, the downgate can be regarded as a reservoir of constant level in which the speed of arrival of the stream leaving the ladle is without influence. In the opening  $MN$ , the flow is under pressure  $h$ , which is the distance of the center of gravity of the opening from the upper level of the metal in the runner or the basin.

**Speed of metal entry into mold cavity** — In the opening  $MN$ , it is:

$$Va = 4.43\sqrt{h}$$

The speed  $Va$  remains constant until the moment when the level of the metal in the mold cavity reaches the section  $MN$ . From this moment onwards it constantly decreases. Thus, assuming the level of the metal in the mold cavity  $EF$  to be at a height  $h'$  from the center of gravity of the opening  $MN$ , then the speed of entry into the mold cavity becomes:

$$Va = 4.434\sqrt{h-h'}$$

If  $m$  is the distance from the top surface of the downgate or runner cup to the lower surface of the top of the mold, from the beginning to the end of casting, then:

$$4.43\sqrt{h} > Va > 4.43\sqrt{m}$$

**Input of the downgate**—When casting under pressure, the ingate governs the input and the section  $Sa$  becomes the preponderating section of the casting system.

(a) *With the first two systems of filling*, the input varying simultaneously with the speed of filling  $Va$ , it is:

$$4.43\sqrt{h} \times Sa > Qa > 4.43\sqrt{m} \times Sa$$

(b) *With filling using a bottom-pouring ladle*. It has been assumed that no control of input is practicably possible; the downgate always remains full. It is always necessary that the input  $Q$  from the ladle is less than  $Qa$ , the maximum input of the downgate. Initially it will be:

$$4.43\sqrt{h} \times Sa > 4.43\sqrt{p} \times Sp$$

$$\text{or } Sa > Sp \frac{\sqrt{p}}{\sqrt{h}} \quad \text{.....(i)}$$

and at the end,

$$4.43\sqrt{m} \times Sa > 4.43\sqrt{p-l} \times Sp$$

$$\text{or } Sa > Sp \frac{\sqrt{p-l}}{\sqrt{m}} \quad \text{.....(ii)}$$

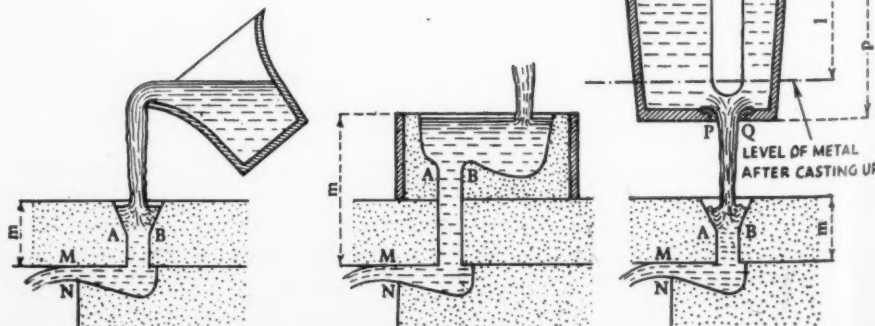


Fig. 10—Ingates at top of mold cavity as used in the three types of pouring.

In order to check the section  $Sa$ , it is necessary to choose from the inequalities (i) and (ii) the one which gives the higher value.

**Bottom running**—What has been established above applies equally well to bottom running. From the start of casting, the opening  $MN$  is closed by metal; the input from thereon constantly decreases as the speed of entry of the metal in the mold cavity.

**Ingate at the top part of the mold cavity**—This is illustrated in Fig. 10. The height of the ingate is generally low in relation to the height  $m$ . As it is negligible, one can postulate:

$$Va = 4.43\sqrt{m} \quad \text{and}$$

$$Qa = 4.43\sqrt{m} \times Sa$$

The speed  $Va$  and the input are constant during the filling of the mold cavity, under the express condition that the input from the ladle also be constant. A tipping ladle used in conjunction with a runner basin fulfills these conditions. With a bottom-pouring ladle, the input decreases with the lowering of the level of the metal in the ladle. At the beginning of casting, there should be the conditions that:

$$4.43\sqrt{m} \times Sa > 4.43\sqrt{p} \times Sp$$

which implies that

$$Sa > Sp \frac{\sqrt{p}}{\sqrt{m}}$$

Then the level of the metal lowers in the runner at the same time as in the ladle. Casting under pressure with an ingate at the top of the mold cavity gives a system of running which largely parallels that obtained by direct filling.

# NEW MEMBERS

## Birmingham Chapter

Elmo M. Boutwell, Foreman, American Cast Iron Pipe Co., Birmingham, Ala.  
E. D. Prickett, Foreman, American Cast Iron Pipe Co., Birmingham, Ala.  
W. A. Wilder, American Cast Iron Pipe Co., Birmingham Ala.

## Central Indiana Chapter

Howard L. Kister, Indianapolis, Ind., Repr., U. S. Hoffman Machinery Co., New York, N. Y.

## Central New York Chapter

Edward J. Clark, Foreman-Core Room, International Heater Co., Utica, N. Y.  
L. W. Curtis, Foreman, New York Air Brake Co., Watertown, N. Y.  
J. Francis Dobbs, Metallurgist, New York Air Brake Co., Watertown, N. Y.  
H. S. Gulick, Supt. of Foundries, New York Air Brake Co., Watertown, N. Y.  
James J. Hunter, Fdry. Foreman, Dept. 49—New York Air Brake Co., Watertown, N. Y.  
Geo. E. Johnson, Foreman, Pattern Dept.—New York Air Brake Co., Watertown, N. Y.  
James J. Mahar, Fdry. Foreman, Dept. 47—New York Air Brake Co., Watertown, N. Y.  
Howard Boyd Nye, Fdry. Engr., New York Air Brake Co., Watertown, N. Y.  
Michael Schneider, Foreman—Core Room, New York Air Brake Co., Watertown, N. Y.  
William P. Ward, Instructor, Vocational High School, Syracuse, N. Y.

## Chesapeake Chapter

Crown Cork & Seal Co., Baltimore, Md. (Raymond B. Hoffmeister, Mgr., Guilford Plant)\*  
Joseph O. Danko, Owner, Danko Pattern & Manufacturing Co., Baltimore, Md.  
C. L. Elgert, E. F. Houghton & Co., Baltimore, Md.  
Raymond F. Foster, Melting Foreman, Lynchburg Foundry Co., Lynchburg, Va.  
Wm. C. Franz, Ass't Secretary, Flynn & Emrich Co., Baltimore, Md.  
Ernest L. Gabler, Consultant, Frick Co., Waynesboro, Pennsylvania.  
Frank B. Gately, Ass't Secretary, Flynn & Emrich Co., Baltimore, Md.  
John A. Heard, Patt. Supv., Crown Cork & Seal Co., Baltimore, Md.  
Howard A. Horner, Metallurgist, Frick Co., Waynesboro, Pa.  
L. L. Martin, Quartermaster Molder, Norfolk Navy Yard, Portsmouth, Va.  
George M. Nauss, Metallurgist, Crown Cork & Seal Co., Baltimore, Md.  
Earl L. Ranker, Foreman, York Ice Machinery Corp., York, Pa.  
Bertram S. Reed, Philadelphia, Pa., Salesman, Whitehead Bros. Co., New York, N. Y.  
John Jay Shank, Director, Wayne Laboratories, Waynesboro, Pa.  
Leonard Squires, Fdry. Foreman, Gibson & Kirk Co., Baltimore, Md.  
Victor F. Stine, Vice-Pres. & Sales Mgr., The Pangborn Corp., Hagerstown, Md.  
George L. Webster, Teacher, Baltimore Polytechnic Institute, Baltimore, Md.  
Alexander L. Wilkens, Skimmer, Gibson & Kirk Co., Baltimore, Md.

## Chicago Chapter

John A. Byers, Vice-President, James B. Clow & Sons, Chicago, Ill.  
Dee D. Cameron, Consulting Engineer, Chicago Heights, Illinois  
Albert DiGirolamo, Apprentice, Chicago Steel Foundry Co., Chicago, Ill.  
Fred G. Koenig, Apprentice, Link Belt Co., Chicago, Ill.  
Robert LaRocca, Apprentice, Chicago Steel Foundry Co., Chicago, Ill.

William Wick, Apprentice, Armour Institute of Technology, Chicago, Ill.

## Detroit Chapter

Arthur Byron, Student, Saginaw Malleable Iron—General Motors Institute, Saginaw, Mich.  
W. R. Hans, District Manager—Detroit, Mich., Whiting Corporation, Harvey, Ill.

## Metropolitan Chapter

Leslie Company, Lyndhurst, N. J. (R. J. McIlwain, Fdry. Supt.)\*  
Gordon I. Lindsay, Jr., Repr. Robeson Process Co., New York, N. Y.  
Harold L. Ullrich, Sacks Barlow Foundries, Inc., Newark, N. J.

## Michiana Chapter

Maurice B. Williams, Chemist and Metallurgist, Kalamazoo Stove & Furnace Co., Kalamazoo, Mich.

## Northeastern Ohio Chapter

S. Allen Nathanson, Vice-President, M. Cohen & Son Co., Cleveland, Ohio.  
Julius Thomas, Foreman-Core Room, Ohio Foundry Co., Cleveland, Ohio.  
W. A. Thompson, Supt., W. O. Larson Foundry Co., Grafton, Ohio.

## Northern Illinois-Southern Wisconsin Chapter

John M. Molique, Gen'l Supt., Beloit Iron Works, Beloit, Wis.  
J. Rubin & Company, Rockford, Ill. (Harry Rubin, Partner)\*

## Northern California Chapter

H. I. Detro, Mrg., American Radiator & Standard Sanitary Corp., Richmond, Calif.

## Ontario Chapter

P. L. Bibbee, Fdry. Supt., Standard Sanitary & Dominion Radiator Ltd., Toronto, Ont., Canada.  
Robert R. Snow, Fdry. Mgr., McKinnon Industries Ltd., St. Catharines, Ont., Canada.  
Wilkinson Foundry Facing & Supply Co. Ltd., Toronto, Ont. (John C. Wilkinson, President)\*

## Quad-City Chapter

L. V. Swanson, Deere & Company, Moline, Ill.

## St. Louis Chapter

Harold S. Garrett, Casting Buyer, Wagner Electric Corp., St. Louis, Mo.  
Earl T. McKinney, Wood Pattern Maker, Key Company, E. St. Louis, Ill.

## Southern California Chapter

Comdr. V. O. Clark, Los Angeles, Calif.—U. S. Navy (Retired)

## Western New York Chapter

Dunkirk Radiator Corporation, Dunkirk, N. Y. (W. B. Slater, Supt.)\*

## Wisconsin Chapter

William C. Messinger, Sales Dept., Sivy Steel Casting Co., Milwaukee, Wis.  
J. N. Moylan, Jr., Dist. Mgr.—Milwaukee, Wis., Federated Metals Division, American Smelting & Refining Company, Whiting, Ind.  
J. Wamnes, Burlington Brass Works, Burlington, Wis.  
C. Wilson, Jr., Burlington Brass Works, Burlington, Wis.

## Outside of Chapter

James B. Clow & Sons, Coshocton, Ohio (Guy P. Clow, Manager)\*

## Foreign

W. J. Dawson, Metallurgical Director, Hadfields Limited, Hecla Works, Sheffield, England.

\*Company Member.

# NEW CHAPTER OFFICERS

## I. R. Wagner, Chairman, Central Indiana Chapter

I. R. Wagner, Electric Steel Castings Co., Speedway, Indianapolis, was re-elected chairman of the Central Indiana chapter. Mr. Wagner was born in Reading, Pa., in 1894 and was graduated from high school in Shamokin, Pa., in 1912. He then entered the employ of the Alan Wood Iron and Steel Co., Ivy Rock, Pa., as a helper in the maintenance department and after a short period was transferred to the chemical laboratory as a test boy. After serving in various capacities in the then developing metallurgical department, he was shifted in 1915 to the Midvale Steel Co., Philadelphia, as an analytical chemist and later became chief chemist, Midvale works, Wilmington, Del. In 1918 he became identified with the inspection division of the ordnance department, establishing checking laboratories at various steel plants and in 1919 was again moved to the arsenal at Watertown, Mass., as a metallurgical chemist. In 1920 he became metallurgist and chief inspector, Electric Steel Castings Co., Indianapolis, and two years later was made superintendent over all the plant operations. In 1934 he was made vice-president and general manager of the firm, succeeding the late M. G. Spencer.

## E. C. Bumke, Michiana Chapter

Vice-chairman of the Michiana chapter for the 1940-41 chapter year is E. C. Bumke, superintendent, malleable division, Oliver Farm Equipment Co., South Bend, Ind. Born in the city of Manistee, Mich., Mr. Bumke received his elementary education in the schools of that city before enrolling at the University of Michigan. He later was graduated from that college with a degree in 1924. Upon completing his formal education he was employed by the Union Malleable Iron Co., E. Moline, Ill., as a foreman for six years; he then became affiliated with the Emerson Brantingham Co., Rock-

ford, Ill., as foreman for three more years. He then took a position with the Oliver Farm Equipment Co. and has been employed there since 1934.

Mr. Bumke also is a member of A.S.M., aside from activities with the A.F.A. Last year Mr. Bumke served on the Michiana chapter board of directors.

## G. L. White, Ontario Chapter

Gerald Langdale White was appointed secretary, Ontario chapter, when S. R. Francis resigned due to ill health. Mr. White is editor, Westman publications, Toronto, Ont. He was born in Heathcote, Ont., and



H. F. McFarlin

attended public schools in that area. He was graduated from the University of Toronto in 1933 with a science degree. Mr. White has been employed in his present position since his graduation. He has written articles too numerous to mention in the magazines published by his firm; most familiar to American foundrymen being the *Canadian Metals & Metallurgical Industries*.

Mr. White takes an active part in the activities of A.F.A. and A.S.M. He also holds memberships in the Canadian Chemical Association and the Canadian Institute of Chemistry.

## L. A. Gosiger, Cincinnati District Chapter

The Cincinnati district chapter has a treasurer which they should be proud to claim their own. L. A. Gosiger, chapter treasurer, has been employed by The S. Obermayer Co., Cincinnati, O., for over 40 years. Mr. Gosiger was born in Cincinnati, O., and attended public schools in that city. Completing his formal education Mr. Gosiger was graduated from St. Xavier College, Cincinnati, in 1900. He then became associated with The S. Obermayer Co. and served in various capacities for over 40 years. He now holds the position of secretary and district manager in the above concern.

## H. F. McFarlin, Cincinnati District Chapter

H. F. McFarlin, elected chairman of the Cincinnati District chapter for the year 1940-41, is superintendent, iron and steel foundry, The Lunkenheimer Co., Cincinnati, Ohio. Born in New Castle, Del., he was educated in the schools of that city. He entered the trade as a general apprentice in 1914 with the Deemer Steel Castings Co., New Castle, and worked there till 1920. He then moved on to Bayonne, N. J., to take the position of converter foreman with the Bayonne Steel Casting Co. He then became affiliated with the Penn-Seaboard Steel Corp., New Castle, Del., as open hearth apprentice. From 1923 to 1932 he was in Easton, Pa., with the Wm. Wharton Jr. & Co. as assistant foundry superintendent. For four years he was melting foreman with the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., and since 1936 has been acting as iron and steel foundry superintendent of The Lunkenheimer Co., Cincinnati, Ohio.

Besides holding membership in the American Foundrymen's Association, Mr. McFarlin is also a member of the Steel Founders Society of America.



E. C. Bumke



G. L. White



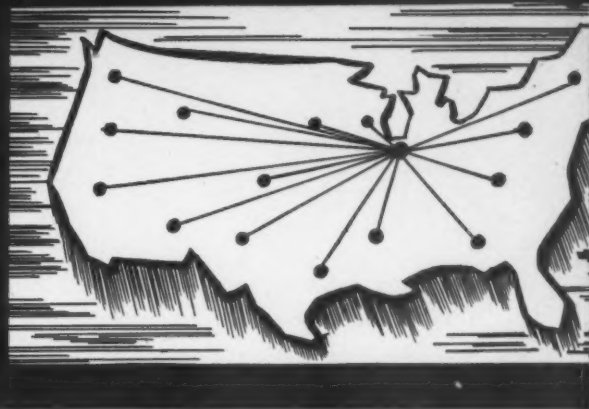
I. R. Wagner



L. A. Gosiger

AMERICAN FOUNDRYMAN

# Chapter Activities



## Nineteenth Chapter Organized, Named Chesapeake

THE nineteenth chapter of the A.F.A. was formally organized at an enthusiastic meeting held at the Lord Baltimore Hotel, Baltimore, Md., on Friday, November 15, with 90 members and guests from Maryland, Southern Pennsylvania, Virginia and the District of Columbia present.

Acting on the recommendation of a By-Laws Committee, "Chesapeake" was adopted as the chapter name, expressive of the general territory covered, which is closely identified with the Chesapeake Bay.

E. W. Horlebein, president, The Gibson & Kirk Co., Baltimore, was elected chapter chairman; J. E. Crown, master molder, Washington Navy Yard, Washington, D. C., vice chairman; L. H. Denton, Baltimore Association of Commerce, Baltimore, secretary-treasurer. Directors were as follows:

### To Serve One Year

- H. S. Malsberger, fdry. supt., American Chain & Cable Co., York, Pa.
- H. A. Horner, met., Frick Co., Waynesboro, Pa.
- J. C. Pendleton, fdry. supt., Newport News Shipbuilding & Dry Dock Co., Newport News, Va.

### To Serve Two Years

- C. L. Frear, U. S. Navy Dept., Bureau of Ships, Washington, D. C.
- C. C. Adams, gen. fdry. supt., Bethlehem Steel Co., Sparrows Pt., Md.
- S. W. Brinson, master molder, U. S. Navy Yard, Portsmouth, Virginia.

### To Serve Three Years

- Wm. C. Franz, asst. secy., Flynn & Emrich Co., Baltimore, Md.

DECEMBER, 1940

Max Kuniansky, asst. gen. mgr., Lynchburg Foundry Co., Lynchburg, Va.

V. F. Stine, 2nd vice pres., Pangborn Corp., Hagerstown, Md.

The meeting was called to order by R. E. Kennedy, secretary of the Association, who introduced three guests, Donald J. Reese, International Nickel Co., who was the first chairman of an A.F.A. chapter, that formed in Chicago in 1934, and who was first chairman of the Metropolitan chapter of New York; Frank G. Steinebach, editor, *The Foundry*, Cleveland, and past chair-

man of the Northeastern Ohio chapter; and I. R. Wagner, Electric Steel Castings Co., chairman of the Central Indiana chapter. Mr. Wagner, as chairman of the youngest A.F.A. chapter, took this occasion to turn over to Mr. Horlebein the "baby" chapter rattle gavel which has been passed from chapter to chapter.

Following the completion of the chapter organization, Chairman Horlebein introduced Don Reese as the speaker of the evening. Mr. Reese gave an unusually instructive discussion on cupola practice. He stressed the need for carbon control, citing factors of importance in this control. He then gave a detailed outline of recommendations which were developed to get the

Pictures taken at the organization meeting of the new "baby" Chesapeake chapter.





Views of Chesapeake chapter meeting. Top left—left to right—I. R. Wagner, Electric Steel Castings Co., Indianapolis, Ind., chairman, Central Indiana chapter; C. L. Freer, U. S. Navy Dept., Washington, a director of the new chapter; D. J. Reese, International Nickel Co., New York, the speaker and past chairman of both the Chicago and Metropolitan chapters; and L. H. Denton, Baltimore Association of Commerce, Chesapeake chapter secretary-treasurer. Top right—A group in earnest discussion. Bottom left—Chairman Wagner, Central Indiana chapter, the former baby in the A.F.A. chapter organization, presenting the baby rattle to E. W. Horlebein, The Gibson & Kirk Co., Baltimore, Chesapeake chapter chairman. Bottom center—E. T. Covington, American Hammered Piston Ring Div., Koppers Co., Baltimore, congratulating Vice Chairman J. E. Crown, Washington Navy Yard, Washington, D. C., while Secretary-Treasurer Denton looks on. Bottom right—Chairman Horlebein inspects the baby rattle closely.

(Photos courtesy F. G. Bruggman, The Gibson & Kirk Co., Baltimore, Md.)

best results from cupola operation, showing some interesting slides, among which were unusual color pictures illustrating the drop in temperature of the metal from the cupola spout to the pouring of the mold. An

exceedingly lively discussion period followed, with Mr. Reese expressing his views on important trends, such as the development of the balanced blast, air preheating, air conditioning and other modern developments.

## Ontario Chapter Talks About Laboratory Controlled Castings

By G. L. White\*, Toronto, Ont.

THE meeting of Ontario chapter on October 25 at the Rock Garden Lodge, Hamilton, drew another record breaking gathering for its technical discussion and the dinner. Chairman D. M. Storie, Fittings, Ltd., Oshawa, was in charge of the proceedings.

The speaker of the evening was Herbert H. Fairfield, metallurgical laboratories, Bureau of Mines, Ottawa. Formerly with the McKinnon Industries, Ltd., St. Catherines, Mr. Fairfield was introduced by N. C. MacPhee of that firm, an Ontario chapter director. The subject of Mr. Fairfield's address was "The Application of Science to Foundry Work" or "Laboratory Controlled Castings."

\*Westman Publications, Ltd., and Secretary-Treasurer, Ontario chapter.

There has never been complete agreement on the causes of scrap castings and with the present demands for highly mechanized armed forces it is imperative that the foundry industry should give this problem careful consideration in approaching the goal of efficient mass production. X-ray examination has shown what surprising defects may exist under the skin of the average casting. Reduction of scrap to a minimum involves the attainment and maintenance of ideal manufacturing conditions, a state only reached through observing every detail and co-ordinating all the factors involved.

From data compiled from the findings of experts the causes of scrap have been attributed to various factors in about the following proportions: Metal, 8;

molding, 8; molding sand, 6; cores, 4; pouring, 2; gating, 2; design, 2; melting, 1; flasks, 1; pattern equipment, 1; and mold assembly, 1.

By keeping records of a great number of tests it is possible in the foundry to arrive at carbon-silicon and manganese-sulphur ratios which will give the greatest freedom from scrap for the manufacture of a given casting under certain conditions. Generalizations in respect to these ratios are of little value and they must be worked out for the individual case. It must be remembered in connection with composition that out of the thirty elements present to some degree in an average gray iron, hydrogen, nitrogen and oxygen probably have the most effect upon its castability.

In examining a gray iron, one of the most important features is the dendrite pattern. By an examination of this at a magnification of 50 diameters it may be possible to tell more about the iron than by a study of the microstructure at magnifications of 500 to 1,000 diameters.

In castings of uneven section, it is important to have the same amount of amorphous metal at all sections, whenever possible. Dendrite length may be controlled, and the requirement for amorphous metal most nearly achieved, by changes in design and the use of chills and graphitizers.

The distribution of ferrite is another factor of highest importance in super-machinable iron. What is desired is a skin of ferrite which is machined off, and if there is too great a depth of ferrite difficulties will be encountered. The distribution of ferrite may be controlled by the addition of alloying elements. Grain size also plays an important part in the machinability of cast iron and methods for its control include the addition of alloys.

Investigations have indicated an important connection between the hardness of cores and the occurrence of scrap castings. If the core is too hard it breaks down too slowly causing cracks and other troubles and if the

core is too soft it collapses too quickly before the molten metal. Reference was also made to the important of molding sand,

methods of gating and rates of pouring used in the production of a minimum number of scrap castings.

## *Metropolitan Chapter Hears Barnett on Core Practice*

By K. A. DeLonge\*, New York

RECENT developments in core baking and mold drying practices, together with core room layout, have been responsible for saving thousands of dollars in the foundry industry, declared C. A. Barnett, Foundry Equipment Co., Cleveland, O., in addressing the Metropolitan chapter on the subject of "Cores and Costs" at the regular monthly meeting Wednesday, November 6, at the Essex House, Newark, N. J. A group of 85 members and guests was in attendance.

Introduced by Technical Chairman H. G. Lamker, Wright Aeronautical Corp., Paterson, N. J., Mr. Barnett related how the elimination of preventable losses in the making and baking of cores was directly responsible for sizeable increases in profit. In some instances this means as much as 50 per cent decrease in core costs with a considerably greater saving through a reduction in scrapped castings.

The speaker listed the four most important factors in core baking as: oven temperature; time of baking; type of oven atmosphere; and circulation of oven air. He pointed out that core strength depended directly upon the first two factors. The use of the lowest oven temperature that can economically be used from a time standpoint was advocated, since this practice allows for a greater factor of safety against oven-baking when cores are not removed from the oven at the proper time and against over-baking thin sections of large, heavy cores.

Mr. Barnett pointed out that savings in fuel could be accomplished by holding to a minimum the dead weight going into the oven. He cited instances where

the weight of steel core plate per pound of sand varied over the range of 1-20 lb. In order to reduce this ratio it is necessary to use strong thin plates so constructed as to resist bending; perforated plates also are helpful in eliminating extra weight.

With regard to the oven atmosphere the speaker stressed the need for a recirculating system in order to hold the oven temperature within the narrow

10°F. band necessary for uniform baking. Along with temperature control it is necessary that sufficient oxygen is constantly introduced to insure the presence of an oxidizing atmosphere essential to the production of strong cores. Mr. Barnett stated that oil and gas are the most common fuels while coal is successfully being used in both stoker-fed and powdered units.

The talk was concluded with the showing of numerous slides illustrating various sizes and types of industrial core and mold drying ovens and emphasizing the advantages of the tower type core oven. The lively discussion which followed dealt with the effect of humidity upon core baking, the optimum proportion of oxygen in the oven atmosphere and the use of infra-red ray lamps in core baking.

## *Quad City Hears Lorig and Dale*

By J. Morgan Johnson\*, Moline, Ill.

DR. C. H. LORIG, Battelle Memorial Institute, Columbus, O., spoke before 75 Quad City chapter members assembled at the Blackhawk Hotel, September 16, in Davenport, Ia. He chose as his subject "Research and Developments in Cast Metals." Chapter Chairman Nathan Lesser conducted the meeting.

Dr. Lorig lectured on the research and development in the cast metal field as accomplished in recent years. He included cast iron, steel and non-ferrous metals in his survey. The speaker pointed out that many of the new developments had caused fresh industries to spring up and that more industries were needed to further carry out the research work to be done. The various fields of each division were discussed showing the improvements in properties, melting, alloying and heat treatment. The quality of castings has been improved considerably due to the attention in the experimental field, and in turn has been an aid to the engineering departments which are designing castings for numerous products.

THE October meeting of the Quad City chapter was held at the Fort Armstrong Hotel, Rock Island, Ill., with Chapter Chairman Nathan Lesser presiding. About 75 members had gathered to hear C. M. Dale, manager, Liberty Foundries Co., Rockford, Ill., talk on "Casting of Piston Rings."

The speaker was introduced by A. H. Putnam, A. H. Putnam Co., Rock Island, Ill. Mr. Dale gave a very interesting and descriptive picture concerning piston ring manufacturing. The speaker stated that the field was highly specialized in manufacturing and equipment. The specialized manufacturing processes called for specialized machinery that would do the work necessary for producing piston rings, such as casting. The melting and analysis of iron used was discussed as well as the materials involved, such as sand, metals, furnaces and pattern equipment. The treatment of rings also was touched upon. The lecturer stated that where it was necessary to make better, lasting rings, subnormal conditions were used. Methods of pattern inspection are important

\*International Nickel Co. and Reporter, Metropolitan chapter.

\*Tri-City Manufacturers' Association and Secretary-Treasurer, Quad City chapter.

because of the close tolerances with which the manufacturer has to work. Machine operations necessary to complete the ring were described. Following the speaker's presentation a deluge of questions broke forth showing the members' interests in Mr. Dale's paper.

### *St. Louis Discusses Cupola Operation*

By J. W. Kelin\*, St. Louis, Mo.

**G**EORGE S. EVANS, Mathieson Alkali Works, New York, presented a most interesting talk on "Cupola Operation and Research" at the November 14 meeting. Mr. Evan's talk, outlining various interesting phases of cupola operation together with the results of some research, was most thoroughly enjoyed by the group.

During the course of the meeting, over which W. Carter Bliss, Scullin Steel Co., presided, several interesting reports were made by chapter officers and committee chairmen.

Special consideration was given to the announcement which informed the members that the 1941 convention would be held in New York City. The members greeted the Executive Committee's decision with approval, and the St. Louis chapter agreed to co-operate 100 per cent in making this convention an outstanding success.

Carl Morken also gave a short resume of the successful Foundry Practice School which is being conducted by the chapter.

The St. Louis chapter also reports that over three hundred have registered and attended the foundry practice school organized in the form of a lecture course. Held weekly, Wednesday nights, subjects are given in accordance with a planned program of information on pattern making, pattern design and are continuing with various speakers giving subjects under the general topic of molding and other kindred items. This school will be conducted throughout the next two or three months

\*Federated Metals Div., A. S. & R. Co., and Secretary-Treasurer, St. Louis District chapter.

and has proved so popular that plans are under way to extend the supposedly twelve lectures to sixteen or eighteen.

### *Col. Rose at Philadelphia*

By J. T. Fegley\*, Philadelphia, Pa.

**N**OVEMBER 8 at the Philadelphia chapter meeting, Engineers Club, Colonel W. W. Rose, vice president, Gray Iron Founders' Society, Inc., was the main speaker.

The Colonel was introduced by Walter Yost, former president of the Philadelphia Foundrymen's Association. Before 90 members and guests Colonel Rose talked about "Inconsistent Sales Practices of Gray Iron Foundries." The Gray Iron Founder's vice president gave a very good presentation and it was well received by the members.

Following the dinner Clarence Ederer, vice president, Ederer, Inc., showed a most interesting colored film entitled "A Vacation in Mexico."

\*North Bros. Mfg. Co. and publicity chairman, Philadelphia chapter.

### *Gregg Speaks in Freeport*

By J. R. Cochran\*, Rockford, Ill.

**N**ORTHERN Illinois-South-Wisconsin chapter members, with Chapter Chairman P. A. Paulson, Gunite Foundries Corp., in charge, welcomed A. W. Gregg, Whiting Corp., to their chapter as speaker November 12.

Before some 50 members and guests at the Hotel Freeport, Freeport, Ill., Mr. Gregg gave some valuable information on "Cupola Operation." He took the operation of the cupola step by step through a day's heat, from the time that the slag from the last heat was chipped out, until the bottom was dropped. He listed the general characteristics of all cupolas and stressed the fact that each cupola is an individual and, like human being, works better when it has a great deal of attention. The speaker passed out sheets to all who were interested, giving the

\*Sundstrand Machine Tool Co. and Technical Secretary, Northern Illinois-Southern Wisconsin chapter.

physical characteristics and operating conditions recommended by his firm for the various sizes of cupolas. Following his talk the meeting was converted into an "open forum" with most of the members participating.

### *Zirzow Addresses*

#### *Central Indiana Chapter*

**T**HE Central Indiana chapter at its meeting, Nov. 4, was favored with a very instructive discussion on core sand and mixture control by E. C. Zirzow, chief chemist, National Malleable & Steel Castings Co., Cleveland. This meeting was held at the Hotel Washington, Indianapolis, with I. R. Wagner, Electric Steel Castings Co., chapter chairman, presiding.

Mr. Zirzow, who has been giving a great deal of attention to core sand control in his plant, first discussed the types of sands used in their various systems, stressing the importance of control of sand grain size. He then described the control tests used in their work, illustrating his points with slides showing records of control, and upper and lower limits fixed for moisture, strength and permeability. He also discussed the use of oil in sands to reduce the amount of water used.

### *Vanick at Cincinnati*

By H. M. Wood\*, Cincinnati, O.

**C**HAPTER Chairman H. F. McFarlin, The Lunkenheimer Co., presided over Cincinnati's monthly meeting, November 12, at the Hotel Alms.

The technical session, which followed the dinner, was turned over to J. S. Vanick, International Nickel Co. He chose as his subject "Engineering Properties of Cast Iron." This paper started with tensile strengths of cast iron and lead up to other related properties.

Preceding Mr. Vanick's talk, he showed a motion picture, "Nickel High-Lights," which illustrated, in an interesting way, the manufacture of nickel.

\*W. W. Sly Mfg. Co. and Secretary, Cincinnati District chapter.

# Kuniansky Talks on Scrap at Pittsburgh

By R. L. Hartford\*, Pittsburgh, Pa.

**D**IFFICULTIES involved in production of good castings using a scrap melt running as high as 100 per cent, in some cases, held the spotlight in a talk presented by Max Kuniansky, general manager, Lynchburg Foundry Co., Lynchburg, Va., before the Pittsburgh Foundrymen's Association.

The meeting was the first technical session of the year, held October 21, Fort Pitt Hotel. R. C. Heaslett, Continental Roll & Steel Foundry Co., and new association president, acted as chairman.

Mr. Kuniansky's talk was a straight forward exposition of the work done by his company, some of the difficulties involved and the means used to solve them. A complete breakdown of costs was shown, and the speaker outlined the results of using the Badeau wage-incentive plan over a number of years.

Work along three general lines was discussed. The company produces small chilled castings, such as plowshares, on a production basis; has a line of cast pipe in large sizes, centrifugally cast against permanent metal water cooled molds; and in addition does a considerable amount of custom work on items such as large pots and kettles.

Production of castings without the use of risers was fully described and evoked considerable interest. Methods of cleans-

ing metal while using a high scrap content charge also came in for considerable discussion. Because of economic disadvantages it is difficult to use much pig iron at the company's plants. Methods whereby scrap is made to serve in place of iron were outlined by the speaker.

Considerable discussion came about following the talk. Of particular interest were methods of alloy content control, deoxidation and the economics of scrap vs. pig iron, as well as the experiences of the company in labor costs under the Badeau system.

## Northern California Holds Sectional Meeting

By G. L. Kennard\*, San Francisco, California

**T**HE November 8 meeting of the Northern California chapter was termed a sectional meeting and possessed three principal speakers. The progress of the meeting was guided by

Chapter Chairman Ivan L. Johnson, Pacific Steel Casting Co.

Ben C. Page, F. K. Simonds Co., Berkeley, talked on M. A. Scott's paper "Production of Uniform Dense Structures in High Test and Alloy Iron Castings." The men that attended this meeting entered into an earnest discussion of the subject following Mr. Page's presentation.

The second section leader was Earl McDonald, Monarch Foundry & Engineering Corp., Stockton. Mr. McDonald discussed the 1940 preprint of J. A. Duma and S. W. Brinson entitled "Application of Controlled Directional Solidification of Large Steel Castings." An interesting question and answer period centered around this paper in which nearly everyone participated.

The non-ferrous members of the chapter heard J. H. Scott, Kingwell Bros., San Francisco, lecture on "Analysis of Non-Ferrous Foundry Defects." The non-ferrous men discussed many of their problems and asked many questions concerning non-ferrous operations.

\*Northern California Foundrymen's Institute and Secretary-Treasurer, Northern California chapter.

Photos of recent Northern California outing. (Top left) A company of golfers at rest. (Top right) Ernie Carr and Pete Valentine dishing out some of their well liked music. (Bottom left) The program committee gets a flash in the pan, and (bottom right) Chapter Chairman Ivan Johnson and Vice Chairman Ed Welch caught in a playful mood.



\*Penton Publishing Co. and Program committee chairman, Pittsburgh Foundrymen's Association.

## Pittsburgh Christmas Party

**P**ITTSBURGH Foundrymen's Association will hold its annual Christmas party December 16 at Hotel William Penn. W. S. Scott, Pittsburgh Coke & Iron Co., Grant Bldg., Pittsburgh, is chairman of the entertainment committee. C. H. Paul, Mackintosh-Hemphill Co., 301 Bingham St. S. S., Pittsburgh, is secretary. Reservations can be sent to either Mr. Scott or Mr. Paul.

DECEMBER, 1940

## *Metropolitan Chapter Off to Splendid Start With First Lecture Course*

SOME 180 young engineers and foundrymen were present at the first meeting of the Metropolitan chapter lecture course to hear Fred G. Sefing, research metallurgist, International Nickel Co., New York City. The course meetings are being held in the auditorium of the Essex County Boys' School of Newark, New Jersey.

Russell J. Allen, Worthington Pump and Machinery Co., Harrison, N. J., and chairman of the Metropolitan chapter, in opening the meeting, addressed the group with some appropriate remarks on the activities of the American Foundrymen's Association, which he said were principally the presentation of technical information on the processes and products of the foundry industry. Chairman Allen then introduced Dr. N. E. Woldman, chief metallurgist, Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J., as chairman of the lecture course committee. Dr. Woldman explained that the lecture course was to be a "Castings Clinic" presenting fundamental information on the manufacture and engineering applications of castings. He then introduced as the lecturer for the first meeting, Mr. Sefing. Mr. Sefing in his talk took as his topic "Pattern and Casting Design." In his presentation he described the steps necessary to produce a casting, the freezing of metals, factors affecting pattern design, closing with a review of factors showing the relation between design of castings and their costs. He stressed the importance of the designer working closely with the foundryman before the patterns were made.

Announcement was made that the course would be divided into two sections of four sessions each. The schedule for the remaining three meetings of the first section was announced as follows:

November 20—Speaker, Sam Tour, Lucius Pitkin, Inc., New York City.

Subject, "Melting Metals and Pouring Castings."

November 27—Speaker W. G. Reichert, American Brake Shoe & Foundry Co., Mahwah, N. J.

## *Reichert Speaks Before Metropolitan Chapter*

By K. A. DeLonge\*, New York, N. Y.

THE first regular meeting of the Metropolitan chapter was held at the Essex House, Newark, N. J., on Wednesday, October 9. The occasion was of particular significance in that several national A.F.A. officers were present: C. E. Hoyt, executive vice president; Past President Marshall Post; W. B. Coleman, director; and L. P. Robinson, director. Chapter Chairman R. J. Allen, Worthington Pump & Machinery Co., presided.

Dr. N. E. Woldman announced an educational course of eight lectures divided into two terms, one to be given this fall and the other during the winter. It is planned that this course shall be presented to appeal to the designing engineer and consumer of castings.

The principal event of the evening was an excellent talk on "How Molding Sand Affects Casting Finish" by W. G. Reichert, metallurgist, American Brake Shoe & Foundry Co., Mahwah, N. J.

So much of what Mr. Reichert said was of great importance that no review of his talk can possibly do it justice. The many phases of sand problems were all carefully presented to show their effect on the casting surface quality, which Mr. Reichert said was of major importance to foundrymen, because the proper surface finish will reduce cleaning costs, and have much better sales value.

The factors which affect finish, which were discussed and

Subject, "The Condition of the Foundry Sand Affects the Castings."

December 11—Speaker, Dr. N. E. Woldman, Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J.

Subject, "Types of Castings as Influenced by Molding Method."

illustrated by the speaker, were sand grain fineness, water content, sea coal, metal temperature, clay content, mold hardness, sand uniformity and facing materials.

Mr. Reichert said in his concluding statement that the desirable finish of castings can be achieved by coordinating the factors involving sand, facings, gating and metal temperature.

Active discussion on practical casting finish problems followed. The discussion was directed by the technical chairman, C. B. Somers, Whitehead Bros. Co., New York, N. Y.

## *Non-Ferrous Talk at Western New York*

By Eliot Armstrong\*, Buffalo, N. Y.

WESTERN New York chapter, meeting at the Hotel Touraine, November 1, had a large gathering on hand to welcome O. W. Ellis. Chapter Chairman John C. McCallum, McCallum Hatch Bronze Co., Inc., was in charge of the meeting.

Mr. Ellis was introduced to the chapter members by Program Chairman Robert K. Glass, Republic Steel Corp. Mr. Ellis, Ontario Research Foundation, gave a splendid lecture relating to "A Few Experiences in the Non-Ferrous Field." All during his discourse Mr. Ellis allowed the members to ask questions. This added greatly to the interest of his presentation.

\*International Nickel Co. and Technical Secretary, Metropolitan chapter.

\*Inter Allied Foundries of New York State and Secretary, Western New York chapter.

## *Gregg Speaks at First Detroit Meeting*

By A. H. Allen\*, Detroit, Mich.

THE first meeting of the Detroit chapter's 1940-41 season was held in the Detroit Room, Detroit-Leland Hotel. Some 58 Motor City men gathered for the dinner, and later several more members arrived for the technical presentation.

In the absence of Chairman Glen Coley, Vice Chairman V. A. Crosby took charge and introduced R. G. McElwee and E. K. Smith, who made a few important announcements about chapter activities.

Speaker of the evening was Fred Gregg, Whiting Corp., Harvey, Ill., who presented a thorough and practical discussion of modern cupola operation and mechanical charging equipment. From his many years of action in operation of foundries and engineering equipment, Mr. Gregg has a wealth of information, from which he drew extensively. Following the formal presentation and slides, a lively discussion ensued, in which a number of prominent foundry engineers in the Western Michigan area, who were on hand, probed into Mr. Gregg's views on cupola operation and control.

\*Secretary, Detroit chapter, and Detroit editor "The Foundry."

## *Shell Making Discussed at Birmingham Chapter*

By Jack Hayes\*, Birmingham, Ala.

BEFORE 300 Birmingham members, the largest gathering of the chapter this year, Brigadier General Levin H. Campbell, Jr., presented a lecture on the "Manufacture of Various Types of Shells." The meeting was held in the Tutwiler Hotel, October 18, with Chapter Chairman W. O. McMahon in the chair. Brigadier General Campbell, Jr., was introduced to the chapter members by Captain Allen H. Rushton, Birmingham Ordnance Department.

\*National Carbon Co. and Reporter, Birmingham District chapter.

The Brigadier General gave one of the most interesting addresses that the southern chapter has had the pleasure of hearing. The speaker has had a vast amount of experience in the manufacturing end of various types of shells and with all this vast majority of information to

draw from he could not help but hold the interest of all those that attended the meeting. Along with his talk the speaker presented moving pictures of the Frankfort Arsenal and also slides of the numerous types and sizes of shells manufactured in that institution.

## *New England Foundrymen Discuss Casting Inspection*

By M. A. Hosmer\*, Boston, Mass.

PROFESSOR JOHN T. NORTON, associate professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., was the New England Foundrymen's principal speaker at their November 13 meeting. Some 65 members and guests assembled at the Engineers Club, Boston, to hear the professor talk on "Inspection of Castings with X-Ray and Radium."

After the usual dinner Francis LeBaron, president, introduced the speaker of the evening's program. Professor Norton's talk was illustrated with many interesting slides. He discussed the value of x-ray and radium as a means of determining the quality of a casting. He started his speech by asking the question, "How good is a good casting?" and then proceeded to explain why it was necessary to see into the inside of a casting before it could be pronounced suitable for use.

The three principal parts of the examination of a casting for defects by means of the x-ray and radium are: technique, interpretation of the photograph and what the defect means in terms of foundry manufacture. The professor said radium was perhaps a cheaper method of examining a casting, but it was dangerous material to handle. He explained that the material could be rented and gave information concerning its cost. Professor Norton explained the magnaflux method of examining castings for defects and related

in detail the advantages of this method as compared to the radium method. He added that the magnaflux method cannot be employed for non-ferrous castings. The speaker also discussed the radiographic method in relation to examining of welds.

After the speaker had concluded, many of those present took part in the discussion which followed.

## *Michiana Chapter Meets at Notre Dame*

THE November 4 meeting of the Michiana chapter was held at Notre Dame University, Notre Dame, Ind., with Vice Chairman E. C. Bumke, Oliver Farm Equipment Co., South Bend, presiding.

Following the dinner held in the dining hall at Notre Dame, the meeting adjourned to the auditorium of the Engineering Building where Vice Chairman Bumke announced that the attendance would be divided into three groups, one to hear A. W. Gregg, Whiting Corp., Harvey, Ill., speak on "Electric Furnace Melting Practice"; the second to hear B. P. Mulcahy, Citizens Gas & Coke Utilities, Indianapolis, discuss "Coke for Cupola Operation"; and the third group was addressed by A. K. Higgins, Allis-Chalmers Mfg. Co., Milwaukee, on "Non-Ferrous Gating."

In his talk, Mr. Gregg was ably assisted by W. Harvey Payne, Hydro Arc Electric Furnace Co., Chicago, and a joint discussion held the attention of the group until late in the eve-

\*Chemist, Hunt-Spiller Mfg. Co., and Reporter, New England Foundrymen's Association.

ning. Mr. Mulcahy's discussion pointed out the requirements that coke must meet to function properly in the cupola and discussed cupola reactions. Mr. Higgins' talk centered about the

top gating of non-ferrous castings. He pointed out the advantages and disadvantages of this method and the types of metals on which this method of pouring could be used successfully.

demonstrate how proper gating methods were responsible for the difference between scrap and usable castings.

Round table meetings have proved to be very popular in the Chicago area. As a result, another such meeting has been scheduled for May 5, 1941.

In spite of the inclement weather and the high wind which reached nearly hurricane proportions, over 175 turned out for the meeting.

## Round Table Features Chicago Program

By B. L. Simpson\*, Chicago, Ill.

**A** ROUND table meeting on gating and risering for gray iron, malleable, steel and non-ferrous castings featured the November 11 meeting of the Chicago chapter at the Chicago Towers Club.

Following the usual dinner, the program was turned over to Vice Chairman L. L. Henkel, Interlake Iron Corp., Chicago, chairman of the Program Committee, who announced that the audience would be divided into three groups, one covering malleable and gray iron; the second, steel; and the third, non-ferrous. Each meeting was to be devoted to gating and risering of the specific metals involved. E. J. Carmody, Chas. C. Kawin Co., Chicago, discussed the gating and risering of gray and malleable irons by means of a series of slides which showed individual cases of particular methods used on various types of castings. H. A. Forsberg, Continental Roll and Steel Foundry Co., Chicago, discussed the gating and risering of steel castings. Mr. Forsberg illustrated his presentation by slides and later called on members of his organization to demonstrate, by means of scale models, particular problems involved in the manufacture of large steel castings.

A fine group of non-ferrous foundrymen turned out to hear A. K. Higgins, Allis-Chalmers Mfg. Co., Milwaukee, who discussed the proper application of gates and risers to non-ferrous work. He described in detail methods for what is termed top pouring of non-ferrous castings, that is, pouring the metal directly through the riser. He discussed the theory involved and the use of this method, as well as the practical aspects. In addition,

he brought various types of non-ferrous castings with him to

## Northeastern Ohio Talks

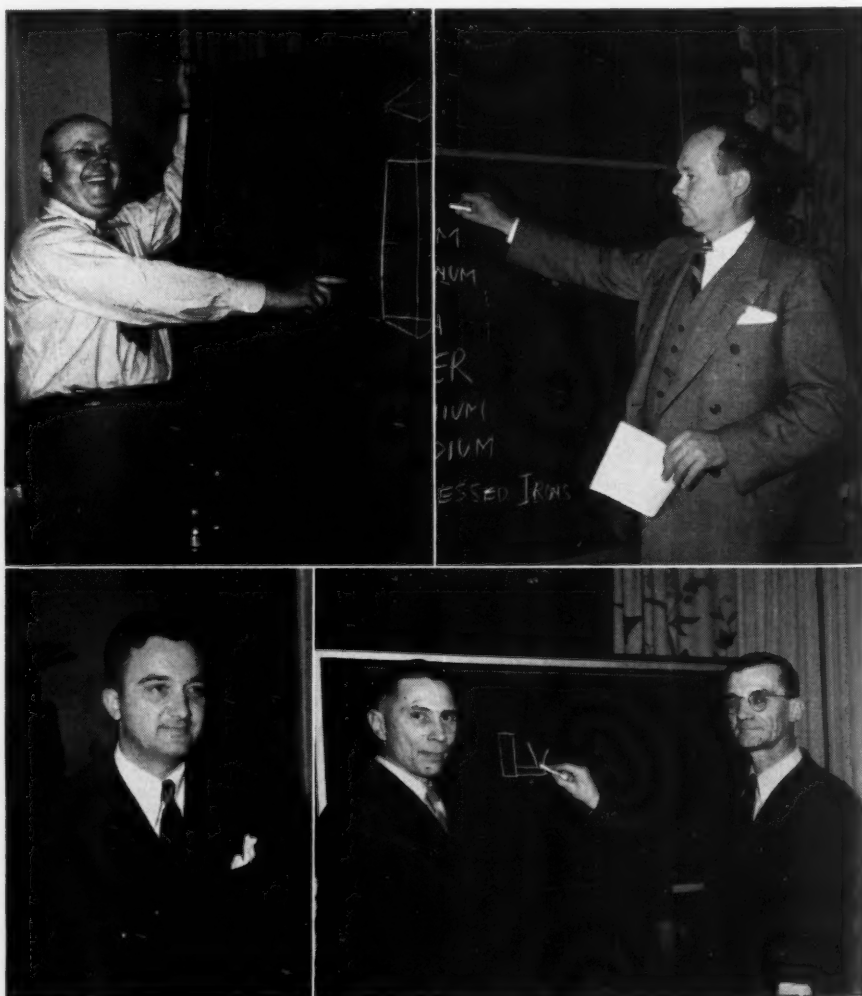
### About Sand Problems

By Edwin Bremer\*, Cleveland, Ohio

**O**VER 250 members and guests attended the November meeting of the Northeastern Ohio chapter, held at the

\*Metallurgical editor, "The Foundry," and publicity chairman, Northeastern Ohio Chapter.

Cleveland Club, Cleveland, on November 14 with President Ray Fleig presiding. W. L. Listerman, Cleveland district special agent, Federal Bureau of Investigation, gave an interest-



Some candid views of speakers taken at the Wisconsin chapter's sectional meeting. (Top left) William George, non-ferrous leader. (Top right) Ed Roth, gray iron speaker. (Bottom left) Larry Hahn, steel lecturer; and (Bottom right) O. I. Dobson (left) and Martin Harder, who spoke on malleable iron.

(Photos courtesy John Bing, A. P. Green Firebrick Co.)

Secretary, Chicago Chapter and National Engineering Co.

ing coffee talk on the work of the bureau and its function. Principal speaker of the evening was H. W. Dietert, president, Harry W. Dietert Co., Detroit, who discussed molding and core sand problems, and demonstrated equipment for determining various characteristics of those sands.

One of the most interesting features of Mr. Dietert's exposition was the visual demonstration of the reaction of various sand mixtures to high temperature conditions. That was accomplished by using a specially designed high temperature oven fitted with a projection lens which depicted on a screen what

was transpiring within the oven. examples of sands were shown which caused rat tails, buckles, scabs, etc., and by making certain changes those defects were eliminated.

In his discussion Mr. Dietert pointed out that control of sand is necessary to reduce the amount of scrap castings to a minimum, and that after some experimental work, definite standards may be set up for the various factors such as grain size, clay content, green strength, etc., for the individual foundry jobs. After establishment of the standards, routine tests will enable the foundryman to keep the sands within the desired limits.

## *Southern California Holds "Stump the Experts" Night*

By Walter F. Haggman\*, Huntington, Calif.

A PROGRAM that was both entertaining and educational was presented before 100 Southern California chapter members at their October 24 meeting in the Hotel Hayward's Blue Room. The "You Stump the Experts" game was received with much enthusiasm by the chapter members and was thoroughly enjoyed by all those who participated. James Eppley, Kinney Iron Works, Los Angeles, conducted the meeting and also served as official moderator during the game.

Before taking an active part in the "battle of wits" Chairman Eppley presented John Spillane, Electro Metallurgical Sales, who gave a short talk on steel foundry practice. This proved to be of great interest to many of the foundrymen.

Following Mr. Spillane's discourse the "Stump the Experts" quiz was started. The following men took the questions fired at them and shot back the answers: The speaker of the evening, John Spillane, took care of the steel questions; Roy E. Paine, Aluminum Company of America, answered questions with non-ferrous aspects; Earl D. Sho-

maker, Kay-Brunner Steel Products, was seldom stymied on questions about patterns; Walter F. Haggman, chapter secretary and Foundry Specialties Co., took care of the historical angle; and Edgar C. Hummel, Utility Electric Steel Foundry, was not stumped on queries concerning steel melting. Timekeeper was Jack Coffman, Los Angeles Steel Casting Co.

A short and humorous talk was given by George Groman on "Dialects of America."

"The Eyes Have It," a motion picture, was shown for the benefit of all chapter members. This picture illustrated the many industrial hazards to eyes that are found in various industries.

### *Foundry Cost Meeting*

THE Institute in Foundry Cost Analysis will be held at the Center for Continuation Study on the main campus of the University of Minnesota, December 5, 6 and 7. The university conducted a similar course last year and considered it a success. The course is arranged to be of value to non-ferrous foundrymen, purchasers of castings, designers and ferrous foundrymen. Further information con-

cerning the course can be obtained by writing to Julius M. Nolte, Director, Center for Continuation Study, University of Minnesota, Minneapolis, Minn.

### *C. E. Bales*

#### *Elected President*

C. E. BALES, vice president, Ironton Fire Brick Co., was elected president of the Ohio Ceramic Industries Association. This action occurred during the annual meeting of the association, held in Columbus, at Ohio State University on November 1 and 2. This trade association has been sponsoring research on ceramic products for manufacturers in Ohio during the past fifteen years.

Mr. Bales also is a prominent figure in A.F.A. refractory circles, being an active member of two refractory committees.

### *Birmingham Dates Set*

FOLLOWING a business meeting of the Birmingham chapter's program committee the dates February 27 and 28 were set aside as the time when the chapter would sponsor its "Ninth Annual Foundry Practice Conference."

### *To Study Durability*

#### *at Illinois*

AT A MEETING of the Subcommittee on Durability, Foundry Sand Research Committee, at the University of Illinois, Urbana, Ill., on Nov. 15, the staff of the university together with the committee, under the chairmanship of C. E. Schubert, assistant professor of mechanical engineering, laid out a program of research which the committee anticipates will eventually lead to a solution of this problem. The function of the Durability Subcommittee is to attempt to find a short method for evaluation of the durability or "life" of molding sand.

Work will soon get under way toward ascertaining basic data which will be used as a guide in measuring the accuracy of several proposed short tests for this property.

\*Secretary, Southern California chapter, and Foundry Specialties Co.



# Abstracts

**NOTE:** The following references to articles dealing with the many phases of the foundry industry, have been prepared by the staff of *American Foundryman*, from current technical and trade publications. When copies of the complete articles are desired, photostat copies may be obtained from the Engineering Societies Library, 29 W. 39th Street, New York, N. Y.

## Aluminum Castings

**AGING.** "Aluminum Castings 'Aged' in Gas-Fired Ovens," by J. E. Hubel, *Industrial Gas*, vol. 19, No. 4, October, 1940, p. 7. The Quality Aluminum Co., Waukesha, Wis., has always been on the lookout for new methods of treating castings. Two years ago this company installed a gas-fired oven for aging heat-treated aluminum castings, such treatment known to make castings of this kind from 50 to 300 per cent stronger. The details of the gas-fired oven are discussed, which give pertinent information about its construction and operation. (Al.)

**POROSITY.** "Porosity in Aluminum-Alloy Castings," *Foundry Trade Journal*, vol. 63, No. 1259, October 3, 1940, pp. 217-218. Following the fundamental technique employed in producing light-alloy castings, by introducing the molten material into a form of pre-determined design and allowing it to solidify, it is seen that the perfection of the final castings will be affected by many factors. Some of these factors are comparatively easy to control; others are more difficult. A few of the factors presented in the article are: the composition and initial condition of the alloy to be used; the procedure adopted for melting; the care exercised in rate of heating; temperature control; duration of maintenance in the molten state, technique of pouring; size and design of mold; and type of casting being produced, that is sand-casting, gravity die-casting or pressure die-casting. (N. F.)

## Cast Iron

**FLAME-HARDENING.** "Flame-Hardening Standardization," by A. L. Hartley, *The Iron Age*, vol. 146, No. 16, October 17, 1940, pp. 25-34. Most failures of flame-hardened parts can be traced to improper selection of material, improper application or improper technique due to insufficient basic experimental work. In this article a series of tests which have produced data that give accurate reproduction of results, uniform structures and uniform penetration of hardness is considered. The entire subject is divided up into six general sections. In the first part of the discussion the characteristics of three types of iron are mentioned. The effect of various heat treatments on the microstructure and hardness of each material also are shown. (C. I.)

**FLAME HARDENING.** "Flame Hardening Standardization," by A. L. Hartley, *The Iron Age*, vol. 146, No. 18, October 31, 1940, pp. 34-43. This timely investigation is an important upward trend toward making the flame hardening process a more useful, beneficial and dependable shop tool. In the other sections of the paper the author has dealt with and described the characteristics of three types of iron and the effects of various heat treatments; and results of a complete series of hardening

experiments on unalloyed, Cr-Ni and Cr-Mo cast iron by the progressive method. In this section attention is directed to standardized operating conditions for hardening a single flat surface, or two or more adjacent flat surfaces by the progressive method. (C. I.)

**PIPE.** "Supporting Strengths of Cast-Iron Pipe for Water and Gas Service," by W. J. Schlick, *The Iowa State College Bulletin* 146, Iowa Engineering Experiment Station, 1940, pp. 11-128. This bulletin presents experimental results which, when combined with load calculation methods previously developed by this station, provide a convenient and reliable means for the structural design of any line of cast-iron pipe subjected to both external load and internal pressure. These experimental results were obtained in tests of 6, 12, 20 and 48 inch pit-cast pipe under a range of representative loading conditions and internal pressures. The general objective of the study has been the development and determination of two ideas: (1) an empirical method for determining the safe combination of external load and internal pressure for any cast-iron pipe, and (2) design values of the strength ratios (ratios of field supporting strength to three-edge test strength) for cast-iron pipe laid in six ways, four of which cover the range of loading and support conditions ordinarily encountered. The researches were made in co-operation with Sectional Committee A21 on Specifications for Cast Iron Pipe and Fittings of the American Standards Association. (C. I.)

## Core

**BEHAVIOR.** "Core Behavior at Elevated Temperatures," by Harry W. Dietert, *The Foundry*, vol. 68, No. 10, October, 1940, pp. 52, 112-113. Method of controlling physical properties of a core at room temperature has received considerable study and is being given much attention by foundrymen. More successful foundry practice may be secured when definite information is available on controlling the action of a core when exposed to the high temperature of molten metal. This paper is along that line and may be of general practical value. The manner in which the expansion and collapse of an oil bonded core may be controlled is of interest. After conducting various experiments the author explains that one way the expansion of a core may be controlled readily is through control of the tensile strength or core hardness. He also states that the rate at which a core collapses should be controlled to obtain the best casting results. (Sa.)

## Cupola Operation

**SULPHUR.** "Sulphur in the Cupola," by C. D. Abell, *Foundry Trade Journal*, vol. 63, No. 1259, October 3, 1940, p. 219. One of the most important aspects of melting irons in the cupola furnace is the

increase in concentration of the sulphur in the iron melted. Usually one or more pig irons are mixed with returned scrap, and, in certain cases, steel scrap bought in the open market, to give an iron approaching as closely as possible to the desired composition. Ferro-manganese has been used for this purpose for about 60 years and during the past few years experiments with soda ash have been carried out. Actually there are several methods which may be adopted and which have all given very satisfactory results. These are listed and points of importance are explained. (F.)

## Gray Iron

**MELTING.** "Marks Progress in Melting Gray Iron," by Don J. Reese, *The Foundry*, vol. 68, No. 11, November, 1940, pp. 45, 98-102. The author stresses the melter's value in foundry operation by showing the importance of being able to do a number of various important jobs. The melter must be able to analyze the prevailing conditions in his foundry area and the product his foundry wishes to produce. He must take into consideration what type of fuel to use; type of furnace, continuous or batch; and other factors important to a successful operating foundry. The accurate weighing of everything that goes through the charging door is pointed out and if not checked carefully will cause trouble when the metal is supposed to meet a certain analysis. The ideal melter must have definite ideas on what is suitable to include in his cupola charge. A definite size in screened coke of a type most suited to his type of iron, whether it be a low carbon or a high total carbon iron, is discussed. New methods developed to analyze iron rapidly for control purposes must be familiar to the melter. The cupola is commented on for its flexibility. The time factor, the problem of pouring metal into molds to obtain desired properties, is another problem of importance to the molder. Various methods for checking suitability of metal at the cupola also should be known by the melter. In conclusion the author presents ideas on conditioned air for the cupola, moisture conditions in the cupola air supply and flowing slag into water. (C. I.)

## Non-Ferrous

**FOUNDRY PRACTICE.** "Problems in Non-Ferrous Foundry Practice," by W. B. George, *The Foundry*, vol. 68, No. 10, October, 1940, pp. 49, 114-117. This paper presents some of the more important items of brass foundry practice in condensed form without going too far into intimate detail on any of the items. Some of the items discussed include sand, cutting gates and runners, melting, and melting under reducing conditions, superheating, defects encountered and various types of brasses manufactured. The author states in order to obtain maximum properties of the alloy and sound castings where virgin metals are melted the copper is heated to a plastic condition, then the zinc, lead and tin are added in that order. Procedures for operating coke-fired furnaces, oil-fired fur-

naces, electric furnaces and open-flame furnaces are outlined. Common defects often blamed on metal instead of other responsible factors are listed. (N. F.)

**GATING.** "Gating Non-Ferrous Castings Is Important," by N. K. B. Patch, *The Foundry*, vol. 68, No. 11, November, 1940, pp. 40-41, 90, 92. The first essential of good gating is to provide the right sized sprue having the necessary capacity to provide ample flow of metal for the casting but not being too big. In this same connection it is pointed out that emphasis should be placed on gating because it is a very important part of making good castings. However, the size of the gates should not be so large that the flow down the sprue is rapid enough to suck with it the floating scum, or in an extreme case, suck air as well as the scum. If such a large amount of metal is necessary for the mold as will cause a heavy rush of metal down through the sprue, then it is best to use two or more sprues. In the case of removing dirt, dross and scum from metal before it enters the mold cavity the author explains the use of the skim gate and its purpose. (N. F.)

## Steel

**BESSEMER.** "Engineers Focus Attention on Bessemer Steel," *The Iron Age*, vol. 146, No. 18, October 31, 1940, pp. 52-53, 83. Renewed interest in bessemer steel was very much in evidence at the annual fall meeting of the institute of metals division and the iron and steel division of the American Institute of Mining and Metallurgical Engineers, held in Cleveland in conjunction with the National Metal Congress and exhibition. This article abstracts the various reports as submitted by the authors at the meeting.

Those papers which were discussed include "The Acid Bessemer Process of 1940," by Dr. Graham, which stresses the small consumption of scrap in the bessemer process. "A Method of Rapid Dephosphorization of Bessemer Steel," presented by G. M. Yocom, described a method of dephosphorization developed at the Benwood, W. Va., plant, which had been used there for the past three years in producing 250,000 tons of low phosphorous steel. (S.)

## Steel Castings

**DEVELOPMENT.** "Some Recent Developments in Iron and Steel Castings," by R. C. Good, *The Foundry*, vol. 68, No. 10, October, 1940, pp. 46-48, 110-112. Several years ago, by changing the charge, foundrymen merely altered the chemical composition in order to modify the physical properties. This plan still is followed to a great extent; but other methods for improving properties without changing the final analysis of the product are being used successfully to an ever increasing extent. Experiments at several research laboratories, including the author's firm connection, show several possibilities in this direction. Emphasis is placed on the influence of the micro-constituents on physical properties, several are mentioned herein. The effect of steady, deoxidized metal, total carbon and silicon on cast iron is related. The effect of superheat on unalloyed gray iron also is discussed. Chemical analysis is used throughout this article. The many photomicrographs shown are presented to illustrate the effect superheating, total carbon and silicon and other items have on metals, chemical analyses and physical properties. (S.)

**DEVELOPMENT.** "Some Recent Developments in Iron and Steel Castings," by

R. C. Good, *The Foundry*, vol. 68, No. 11, November, 1940, pp. 42-44, 103-105. Foundrymen making irons that contain excessive amounts of oxides can use deoxidizers effectively to eliminate characteristic weaknesses and close the grain of the iron. This article tends to tell the foundryman what elements to use in order to obtain the best results from his metal. The uses of calcium, manganese and zirconium, vanadium, silicon and aluminum are stated and telling what properties they impart to the metal. (S.)

## Testing

**STRENGTH.** "Static Crack Strength of Metals Its Determination and Significance," by Maxwell Gensamer, *Metal Progress*, vol. 38, no. 1, July, 1940, pp. 59-64. The engineering value of the technical cohesive strength (or static crack strength) is unknown. One of the reasons for this has been the difficulty of machining the necessary notches, perfectly sharp, especially in hard metals such as steel tempered to above Rockwell C-40. Simple methods are now available for the determination of the technical cohesive strength of metals. Success can be reported, for two methods have been developed that require little enough time and skill to be useful. Both start with machined 60° notches but do not require of this notch any greater sharpness or precision than can be achieved easily by any reasonably competent mechanic. These tests are related in detail by the author. Through the use of these tests it is possible for any laboratory to measure this property and study its usefulness. These tests may well explain some otherwise unexplained metallurgical failures in service. (T.)

# December Chapter Meeting Schedule

## December 2

### Central Indiana

Hotel Washington, Indianapolis, Ind.  
"Foundry Metallurgy Brought Down to Earth"  
DR. A. B. KINZEL, Union Carbon & Carbide Co.

★ ★

## December 3

### Michiana

La Salle Hotel, South Bend, Ind.  
"Foundry Cost and Operation"  
D. P. FORBES, Gunite Foundries Corp.

★ ★

## December 4

### Metropolitan

Essex House, Newark, N. J.  
"Cupola Operation"  
D. J. REESE, International Nickel Co.

★ ★

## December 7

Northern Illinois-Southern Wisconsin  
Hotel Faust, Rockford, Ill.  
Christmas Party

★

### Quad City

Blackhawk Hotel, Davenport, Iowa  
Christmas Party

## December 9

### Chicago

Chicago Towers Club  
G. S. EVANS, Mathieson Alkali Works,  
New York City  
"Cupola Research"

★ ★

## December 11

New England Foundrymen's Association  
Engineers Club, Boston  
"Capitol 0687"

MANFRED BOWDITCH,  
Director, Div. Occupational Hygiene,  
Dept. Labor and Industry, Mass.

★ ★

## December 12

Northeastern Ohio  
Hotel Carter, Cleveland  
Christmas Party

★

### St. Louis

DeSoto Hotel, St. Louis  
Christmas Party

★ ★

## December 13

Central New York  
Hotel Onondaga, Syracuse  
"Sand"  
H. W. DIETERT, Harry W. Dietert Co.

### Northern California

Alexander Hamilton Hotel,  
San Francisco  
"Business Outlook for the Next Year"  
E. L. KELLY, Business Extension Dept.,  
Bank of America  
Motion Picture—"Manufacture of  
Grinding Wheels"—Norton Co.

★

### Southern California

Lakewood Country Club, Long Beach  
Christmas Stag Party

★

## December 16

Pittsburgh Foundrymen's Association  
Hotel William Penn  
Christmas Party

★ ★

## December 20

Philadelphia  
HiTop Country Club, Drexel Hill, Pa.  
Christmas Party

★

### Wisconsin

Hotel Schroeder, Milwaukee  
Christmas Party

★ ★

## December 28

Cincinnati District Chapter  
Kenwood Country Club  
Christmas Party

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